THE

AMERICAN GAS-LIGHT JOURNAL.

THE OFFICIAL GAZETTE OF

LIGHT, HEAT, WATER-SUPPLY, AND SEWERAGE.

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VOL. IV.—No. 65. NEW-YORK, MONDAY, SEPTEMBER 1, 1862. $3 PER ANNUM.

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Herring's Champion Burglar-Proof Safes, with Herring & Floyd's New Patent Crystalized Iron, the only metal which cannot be drilled.

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HALF A MILLION OF DOLLARS.

Herring's Patent Fire and Burglar-Proof Safes *combined*, (one Safe within another,) making the most perfect protection from fire and thieves now known.

FIVE OF HERRING'S SAFES VICTORIOUS!

WELLSBORO', Penn., December 21, 1861.

Messrs. Herring & Co., New York:

Gentlemen,—At the great fire which occurred here on the 18th December last, my store, with a number of other buildings, was entirely destroyed; no less than seven places of business were burnt out and five of your safes severely tested, in every instance saving their entire contents, to the complete and perfect satisfaction of the owners. Two of your Herring's Patent Champion Safes which were in my building remained there through the entire conflagration, and were not opened until the day after the fire. No water was thrown on the building. Everything in my safe after the fire was nearly as good as new. C. L. Wilcox also preserved all his books, papers, and money in two of your safes, both being in same fire. Wm. Roberts was also the fortunate owner of another of your Patent Champion Safes, which was severely tested, and saved completely his books, papers, and money. The result has given great satisfaction, and we want no safe but Herring's Champion. Please send me one same size I last bought of you immediately. Send by N. Y. & Erie R.R. via Tioga depot. JOHN R. BOWEN.

I had two of Herring's Safes in above fire. They saved my books, papers, and $2,000 *in bank bills*. C. L. WILCOX.

HERRING'S PATENT CHAMPION saved my books, papers, and about $400 in *paper money*. I would use no other. WILLIAM ROBERTS.

GREAT FIRE IN PEARL AND FULTON STS.

NEW YORK, Jan. 27, 1862.

Messrs. HERRING & Co., No. 251 Broadway:

Gentlemen,—The large HERRING'S PATENT CHAMPION SAFE you made for me a few years ago has been put to a severe test in the great fire corner Fulton and Pearl sts., on the 26th inst., which entirely destroyed my building, together with many others.

The fire commenced about 6 o'clock on Sunday morning, and the safe was taken from the ruins after an exposure of more than thirty hours.

Your Safe contained all my books, insurance policies, and other valuable papers besides, gold and silver, bank bills, coupon bonds, &c., amounting to over Two Hundred Thousand Dollars. Everything in the Safe is in perfect order, except the binding of the books being steamed.

Your Patent Champion Safe gives us great satisfaction, and has guarded safely through the fire every dollar of its contents.

Truly yours, A. S. FOSTER.

GREAT FIRE IN NEW JERSEY.

NEW BRUNSWICK, N. J., January 18th, 1862.

Messrs. HERRING & Co.,

No. 251 Broadway, New York:

Gentlemen,—At the recent extensive fire in our city, on Wednesday morning last, 15th inst., I was the fortunate owner of one of your HERRING'S PATENT CHAMPION SAFES, which contained some books and a number of valuable papers.

The heat in my store was very great, and the safe subject to an intense heat. I felt great interest in the safety of my papers, as a number of castings in my store and within a few feet of the safe were melted. Nothing, indeed, was saved in my building, except the contents of your safe, which I am happy to inform you was completely preserved, after a thorough roasting for some seventeen hours. The result has exceeded my anticipations, and fully confirmed my confidence in the security of your Herring's Patent Safe. Please send me another of larger size, and refer all incredulous to my books and papers, which it gives me great pleasure to show.

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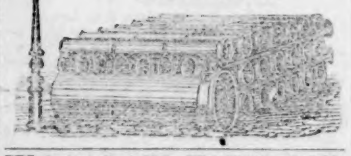

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PATENT-OFFICE NOTICES.

UNITED STATES PATENT-OFFICE,
WASHINGTON, April 17, 1862.

ON THE PETITION OF PHEBE Ann Fisk, Executrix, &c., of Almond D. Fisk, late of the City, County, and State of New York, praying for the extension of a Patent granted to the late Almond D. Fisk, Nov. 14, 1848, and re-issued March 6, 1860, for an improvement in Coffins, for seven years from the expiration of said Patent, which takes place on the 14th day of November, 1862.

It is ordered that the said petition be heard at the Patent-Office on Monday, the 27th of October next, at 12 o'clock m.; and all persons are notified to appear and show cause, if any they have, why said petition ought not to be granted.

Persons opposing the extension are required to file in the Patent-Office their objections specially set forth in writing at least twenty days before the day of hearing; all testimony filed by either party to be used at the said hearing must be taken and transmitted in accordance with the rules of the office, which will be furnished on application.

The testimony in the case will be closed on the 13th of October next; depositions and other papers relied upon as testimony, must be filed in the office on or before the morning of that day; the arguments, if any, within ten days thereafter.

Ordered, also, that this notice be published in the "National Republican," Washington, D. C., and "Tribune," New York, N. Y., once a week for three successive weeks; the first of said publications to be at least sixty days previous to the day of hearing. D. P. HOLLOWAY,
Commissioner of Patents.

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(To be continued.)

SIEMEN'S REGENERATIVE GAS FURNACE.

At a meeting of the Institution of Mechanical Engineers of London, England, held June 30, 1862, the following paper was read by Mr. C. William Siemens. We are indebted to *Newton's London Journal* for the report of the meeting.

The arrangement of furnaces about to be described is applicable with the greatest advantage in cases where great heat has to be maintained: as in melting and refining glass, steel, and metallic ores, in puddling and welding iron, and in heating gas and zinc retorts, &c. The fuel employed, which may be of very inferior description, is separately converted into a crude gas, which, in being conducted to the furnace, has its naturally low heating power greatly increased by being heated to nearly the high temperature of the furnace itself, ranging to above 3,000° Fahr.; undergoing at the same time certain chemical changes, whereby the heat developed in its subsequent combustion is increased. The heating effect produced is still further augmented by the air necessary for combustion being also heated separately to the same high degree of temperature, before mixing with the heated gas in the combustion chamber or furnace; and the latter is thus filled with a pure and gentle flame of equal intensity throughout the whole chamber. The heat imparted to the gas and air before mixing is obtained from the products of combustion, which, after leaving the furnace, are reduced to a temperature frequently not exceeding 250° Fahr. on reaching the chimney; thereby effecting great economy in fuel, with other advantages.

The transfer of heat from the products of combustion to the air and gas entering the furnace, is effected by means of regenerators, the principle of which has been recognized to some extent since the early part of the present century, but has not hitherto been carried out in any useful application in the arts, unless the respirator invented by Dr. Jeffreys be so considered. The discovery of this principle is ascribed to Rev. Mr. Stirling, of Dundee, who, in conjunction with his brother, James Stirling, attempted, as early as the year 1817, to apply it to the construction of a hot-air engine; their engine did not, however, succeed, nor did Captain Ericsson's later attempts in the same direction lead to more satisfactory results. The economical principle of the regenerator having attracted the writer's attention in 1846, he constructed in the following year an engine in which superheated steam was used in conjunction with the regenerator: many practical difficulties, however, prevented a realization of the success which theory and experiments appeared to promise; but it is gratifying to find that one principle then adopted—that of superheating the steam—has since received the sanction of an extended application.

The employment of regenerators for getting up a high degree of heat in furnaces, was suggested in 1857 by the writer's brother, Mr Frederick Siemens, and has since been worked out by them conjointly through the several stages of progressive improvement. The results obtained by the earlier applications of the principle were communicated by the writer in a paper read at a former meeting of the Institution, and two or three of the furnaces then described, employed for heating bars of steel, still remain in operation. In attempting, however, to apply the principle to puddling, and other large furnaces, serious practical difficulties arose, which, for a considerable time, frustrated all efforts; until, by adopting the plan of volatilizing the solid fuel in the first instance, and employing it entirely in a gaseous form for heating purposes, practical results were at length obtained, surpassing even the sanguine expectations previously formed.

In the early form of the regenerative heating furnace, which has been in continuous work during the last three years for heating bars of steel at Messrs. Marriott & Atkinson's Steel Works, Sheffield, and also at the Broughton Copper Works, Manchester, there is a single fireplace containing a ridge of fuel, fed from the top, and two heating chambers, in which the bars of metal to be heated are laid with a regenerator at the end of each chamber, by which the waste heat passing off from the furnace is intercepted on its way to the chimney, and transferred to the air entering the furnace. Each regenerator is composed of a mass of open fire-bricks, exposing a large surface for the absorption of heat through which the products of combustion are made to pass from the furnace, and are thus gradually deprived of nearly all their heat previous to escaping into the chimney. The end of the regenerator nearest the furnace becomes gradually heated to nearly the temperature of the furnace itself, while the other end nearest the chimney remains comparatively cool. The direction of the draught being now reversed by means of a valve, the air entering the furnace is made to pass through the heated regenerator in the contrary direction, encountering first the cooler portions of the brickwork, and acquiring successive additions of heat in passing through the regenerator, until it issues into the first chamber of the furnace at a very high temperature, and, traversing the ridge of fuel, produces a flame which fills the second heating chamber; whence the products of combustion passing through the second cold regenerator deposit their heat successively in the inverse manner, reaching the chimney comparatively cool. By thus alternating the current through the two regenerators, a high degree of temperature is maintained constantly in the furnace. This arrangement of furnace is evidently applicable only in exceptional cases where two chambers are to be heated alternately, nor does it admit of being carried out upon a large scale.

In heating a single chamber the expedient was resorted to of providing two fireplaces, to be traversed in succession by the heated air, with the heating chamber placed between. Here the difficulty arose that the air, the oxygen of which was already combined with carbon (forming carbonic acid), in traversing the first fireplace, took up a second equivalent of carbon (forming carbonic oxide) in traversing the second, so that the fuel of the second fire was consumed to no purpose. In order to diminish this loss, and also avoid impairing the draught by a double resistance, the ridges of fuel were discontinued, and the coal was fed into the furnace from the sides resting on a solid hearth, to be there volatilized by the heated air passing over it. By frequently stirring the first fire, its combustion was favored until the current was reversed, when it was left undisturbed until the next change, and so on alternately. It was found very difficult, however, to maintain an active and uniform combustion, and to burn the purely carbonaceous substance that was left in the fireplace after the gaseous portion of the fuel had been volatilized; and it had frequently to be raked out in order to make room for fresh gaseous fuel. This circumstance led to the first step towards the employment of fuel in the form of gas, by providing a small grate below the heap of fuel, through which a gentle current of air was allowed to enter, forming carbonic oxide, which afterwards further combined with oxygen on meeting with the hot current of air entering the furnace from the regenerator. The two fireplaces of alternating activity were, however, attended with considerable practical inconvenience; the furnacemen, in particular, disliked the idea of attending two fireplaces instead of one, and being little interested in the saving of fuel, took no pains to work the furnace in a satisfactory manner.

It therefore became necessary to devise a plan of heating a single chamber continuously by one fireplace, in combination with the alternate reversal of currents through the regenerators, but without reversing the direction of the flame. This was accomplished by means of double reversing valves, and was practically carried out in a puddling furnace that worked for a considerable length of time at the ironworks of Messrs. R. & W. Johnson, near Manchester.

There still remained drawbacks, however, which prevented an extensive application of this form of furnace: the fire required frequent attention, and it was difficult to maintain a uniform volume of flame in the furnace; the reversing valve at the hot end of the regenerators was, moreover, liable to get out of order, and the furnace was costly to erect.

The most important step in the development of the regenerative furnace, has been the complete separation of the fireplace or gas producer from the heating chamber or furnace itself. When a uniform and sufficient supply of combustible gas is ensured, it can evidently be heated just like the air, by being passed through a separate regenerator before reaching the furnace, whereby its heating power is greatly increased. The difficulty of maintaining a uniform flame in the furnace is thereby certainly removed, and there is no longer any necessity for keeping the flame always in the same direction through the furnace, since the gas can be introduced with equal facility at each end of the heating chamber in turn, and the periodical change of direction of the flame through the furnace tends only to make the heat more uniform throughout. The new plan of a separate gas producer has now been successfully carried out in practice, and there are already a considerable number of the regenerative gas furnaces in satisfactory operation in this country and on the continent, applied to glass-houses, iron furnaces, &c. In the neighborhood of Birmingham, at Messrs. Lloyd & Summerfield's glass-works, a flint glass furnace, constructed upon this plan, has now been in continuous operation for nearly twelve months, and affords a good opportunity for ascertaining the consumption of fuel of the regenerative furnace as compared with the previous furnace performing the same work. At the glass-works of Messrs. Chance, Brothers & Co., near Birmingham, the regenerative gas-furnace has been under trial for the same length of time, and has latterly been adopted for the various purposes in crown and sheet glass making upon a very large scale. Messrs. James Russell & Sons, Crown Tube Works, Wednesbury, are also applying the furnace to the delicate operation of welding iron tubes. Another flint glass furnace, erected by Messrs. Osler, in Birmingham, and several puddling furnaces erected by Messrs. Gibbs Brothers, at Deepfields, and by Mr. Richard Smith, at the Round Oak Iron Works, are amongst the latest applications of the regenerative gas furnace, the designs having in all cases been furnished by the writer, and carried out under his brother's immediate superintendence.

The gas producers are entirely separate from the furnace where the heat is required, and are made sufficient in number and capacity to supply several furnaces. The fuel is supplied at intervals of from six to eight hours through covered holes, and descends gradually on an inclined plane, set at an inclination of from 45° to 60° according to the nature of the fuel used. The upper portion of the incline is made solid, being formed of iron plates covered with fire-brick; but the lower portion is an open grate formed of horizontal flat steps. At the foot of the grate is a covered water trough, filled with water up to a constant level from a small feeding cistern, supplied by a water-pipe with a ball tap. Below the water trough is an opening for drawing out clinkers, which generally collect at that point. Small stoppered holes are provided at the top of the producer, to allow of putting in an iron bar occasionally to break up the mass of fuel and detach clinkers from the sidewalls. Each producer is made large enough to hold about ten tons of fuel in a low incandescent state, and is capable of converting about two tons of it daily into a combustible gas, which passes off into a gas-flue leading to the furnaces.

The action of the gas producer in working is as follows: The fuel descending slowly on the solid portion of the inclined plane, becomes heated, and parts with its volatile constituents, the hydrocarbon gases, water, ammonia, and some carbonic acid, which are the same as would be evolved from it in a gas retort. There now remains from 60 to 70 per cent. of purely carbonaceous matter to be disposed of, which is accomplished by the slow current of air entering through the grate, producing regular combustion immediately upon the grate; but the carbonic acid thereby produced, having to pass slowly on through a layer of incandescent fuel, from three to four feet thick, takes up another equivalent of carbon, and the carbonic oxide thus formed passes off with the other combustible gases to the furnace. For every cubic foot of combustible carbonic oxide thus produced, two cubic feet of incombustible nitrogen pass also through the grate, tending greatly to diminish the richness or heating power of the gas. Not all the carbonaceous portion of the fuel is, however, volatilized on such disadvantageous terms; for the water trough at the foot of the grate, absorbing the spare heat from the fire, emits steam through small holes, under the lid; and each cubic foot of steam, in traversing the layer of from three to four feet of incandescent fuel, is decomposed into a mixture consist-

ing of one cubic foot of hydrogen and nearly an equal volume of carbonic oxide, with a variable small proportion of carbonic acid. Thus, one cubic foot of steam yields as much inflammable gas as five cubic feet of atmospheric air; but the one operation is dependent upon the other, inasmuch as the passage of air through the fire is attended with the generation of heat, whereas the production of the water gases, as well as the evolution of the hydrocarbons, is carried on at the expense of heat. The generation of steam in the water trough being dependent on the amount of heat in the fire, regulates itself naturally to the requirements; and the total production of combustible gases varies with the admission of air; and since the admission of air into the grate depends, in its turn, upon the withdrawal of gases evolved in the producer, the production of the gases is entirely regulated by the demand for them.

In order to deliver the gas into the furnace without depending upon a chimney draught for that purpose, the following plan has been adopted: The mixture of gases, on leaving the producers, has a temperature ranging between 300° and 400° Fahr., which must, under all circumstances, be sacrificed, since it makes no difference to the result at what temperature the gas to be heated enters the regenerators, the final temperature being in all cases very nearly that of the heated chamber of the furnace, or, say, 2,500° Fahr. The initial heat of the gas is, therefore, made available for producing a plenum of pressure by making the gas rise about 20 feet above the producers, then carrying it through a horizontal tube twenty or thirty feet long, and letting it again descend to the furnace. The horizontal tube being exposed to the atmosphere, causes the gas to lose from 100° to 150° of temperature, which increases its density 15 to 20 per cent., and gives a preponderating weight to that extent to the descending column, urging it forwards into the furnace.

The author then described the application of the regenerative gas furnace to a melting furnace in course of erection at the British Plate Glass Works, near St. Helen's. This furnace was selected because of its improved details of construction. The heating chamber of the furnace contains twelve glass pots, which are got out through the side doors when the glass is ready for casting upon the moulding table. Underneath are placed transversely four regenerators, composed of open fire-bricks built up on a grating; they are arched over at top, and support the bed or siege of the furnace. The regenerators work in pairs—the two under the right-hand end of the siege communicating with that end of the heating chamber, while the other two communicate with the opposite end. The gas enters the chamber through three passages, and the air through two intermediate passages, whereby they are kept entirely separate up to the moment of entering the furnace, but are then able immediately to mingle intimately, producing at once an intense and uniform flame in the heating chamber. The siege is built of fire-brick, with a number of transverse channels, through which the cold entering air is made to pass on its way into the air flue. By this means, the siege is kept comparatively cool, so that no fluid glass can pass through crevices into the regenerators. Any melted glass that may fall from the heating chamber through the apertures at the ends of the siege does not get into the regenerators, but falls into pockets, whence it can be removed through openings in the sidewalls. The passage by which the air enters affords the means of getting at the regenerators through an opening at the end of each.

From the air-flue, the entering air is directed by a reversing valve into the air regenerator, and there becomes heated, ready for entering the furnace; at the same time the gas entering from the gas-flue is directed by a reversing valve into the gas regenerator, where it becomes heated to the same temperature as the air. Similarly the products of combustion, on leaving the opposite end of the furnace, pass down through the second pair of regenerators, and, after being here deprived of their heat, are directed by the reversing valves into the chimney flue. When the second pair of regenerators have become considerably heated by the passage of the hot products of combustion, and the first pair correspondingly cooled by the entering air and gas, the valves are reversed, and the currents caused to pass through the regenerators and the heating chamber in the contrary direction; whereby the hot pair of regenerators is now made use of for heating the gas and air entering the furnace, while the cool pair abstracts the heat from the products of combustion escaping from the furnace. The supply of air and gas to the furnace is regulated by adjustable stop-valves, whereby the nature and volume of the flame in the furnace may be varied at pleasure; whilst the chimney damper is used to regulate the amount of pressure in the furnace in relation to the atmosphere, so as to allow the opening of working holes.

In setting out each individual furnace, the heating effect required, the quality of the fuel employed, and the particular nature of the process to be performed, have to be considered. The amount of heat required determines the capacity of the regenerators: and the gas regenerators require fully as large a capacity as the air regenerators, and sometimes even a greater. This would, perhaps, hardly be expected, but will be seen to be the case from the following considerations. The gases proceeding from the gas-producers are a mixture of olefiant gas, marsh gas, vapor of tar, water and ammoniacal compounds, hydrogen gas, and carbonic oxide; besides nitrogen, carbonic acid, some sulphuretted hydrogen, and some bisulphuret of carbon. The specific gravity of this mixture averages 0.78, that of air being 1.00; and a ton of fuel, not including the earthy remnants, produces, according to calculation, nearly 64,000 cubic feet of gas. By heating these gases to 3,000° Fahr., their volume would be fully six times increased, but, in reality, a much larger increase of volume ensues, in consequence of some important chemical changes effected at the same time. The olefiant gas and tar vapor are well known to deposit carbon on being heated to redness, which is immediately taken up by the carbonic acid and vapor of water—the former being converted into carbonic oxide, and the latter into carbonic oxide and pure hydrogen. The ammoniacal vapors and sulphuretted hydrogen are also decomposed, and permanently elastic gases, with a preponderance of hydrogen, are formed. The specific gravity of the mixture is reduced, in consequence of these transformations, to 0.70, showing an increase of volume from 64,000 to nearly 72,000 cubic feet per ton of fuel, taken at the same temperature. This chemical change represents a large absorption of heat from the regenerator, but the heat is given out again by combustion in the furnace, enhancing the heating power of the fuel beyond the increase due to elevation of temperature alone.

The advantages of the regenerative gas furnace are of equal value in the case of puddling and welding iron. In a puddling furnace constructed on this plan, the four regenerators are arranged longitudinally underneath the puddling chamber, which may be of the usual form. In order to complete the combustion of the gas and air in passing through the comparatively short length of puddling chamber, it is necessary to mix them more intimately than is requisite in the large glass furnaces. For this purpose, a mixing chamber is provided at each end of the puddling chamber, and the gas and air from the regenerators are made to enter the mixing chamber from opposite sides; the gas aperture is, moreover, placed several inches lower than the air aperture, so that the lighter stream of gas rises through the stream of air, while both are urged forward into the puddling chamber, and an intense and perfect combustion is produced. The mixing chambers are sloped towards the furnace, in order to drain them of any cinders which may get over the bridge. The reversal of the current through the furnace is effected about every hour, by reversing valves in the air and gas flues, the arrangement of which is exactly similar to that already described in the glass furnace: the supply of gas and air is regulated by throttle valves, and the draught through the furnace by the ordinary chimney damper.

This same arrangement, with obvious modifications, may be applied also to blooming and heating furnaces, the advantages in both cases being a decided saving of iron, besides an important saving in the quantity and quality of the fuel employed. The space saved near the hammer and rolls by doing away with fireplaces, separate chimney stacks, and stores of fuel, is also a considerable advantage in favor of the regenerative gas furnace in iron-works. The facility which it affords for either concentrating the heating effect, or diffusing it equally over a long chamber, by effecting a more or less rapid mixture of the air and gas, renders the furnace particularly applicable for heating large and irregular forgings, or long strips or tubes, which have to be brought to a welding heat throughout. It has already been applied, to a considerable extent, in Germany for heating iron; having been worked out there under the direction of the writer's eldest brother, Dr. Werner Siemens, who has also contributed essentially to the development of the system. The furnaces at the extensive iron and engine works of M. Borsig, of Berlin, are being remodelled for the adoption of this system of heating, as have also been those at the imperial factories at Warsaw.

Another important application of the regenerative gas furnace is as a steel melting furnace, in which the highest degree of heat known in the arts is required—presenting, consequently, the greatest margin for saving of fuel. This application of the regenerative gas furnace is rapidly extending in Germany, but has not yet practically succeeded in Sheffield, where it was also tried: it is, however, in course of application at the Brades Steel Works, near Birmingham.

Other applications of the regenerative gas furnace are being carried out at the present time; among which may be mentioned, one to brick and pottery kilns, for Mr. Humphrey Chamberlain, near Southampton; for Messrs. Cliff, of Wortley, near Leeds; and for Mr. Cliff, of the Imperial Potteries, Lambeth; also the heating of gas retorts at the Paris General Gas-Works, and at the Chartered Gas Company's Works, London. The description already given, however, is sufficient to show the facility with which this mode of heating may be adapted to the various circumstances under which furnaces are employed. The important application of the regenerative system to hot-blast stoves for blast furnaces, by Mr. E. A. Cowper, has already been communicated to the Institution.

The experience heretofore obtained with the regenerative mode of heating, shows that it is attended with the greatest proportionate advantage in localities where good coal is scarce, but where an inferior fuel abounds. This applies most forcibly to the South Staffordshire district, where the best coal, in lumps, is worth 12s. 6d. per ton, whereas good slack can be had at 3s. or 4s. per ton. The question gains, moreover, in importance when it is considered that, according to the best authorities, the thick coal of the district is coming to an end, while millions of tons of coal dust have accumulated, of no present commercial value, which, on being converted into gas in the manner described, by means of the gas producers, would acquire a heating value, equal at any rate, to the same weight of the best coal, in the manner in which it is at present used. Considering also the proximity of the pits to the iron-works in this district, it may be suggested, whether the gas producers, being of very simple construction, might not with advantage be placed near the banks of fuel, above or even under ground,—the gas being conveyed to the works by a culvert, so as to supersede carting of the fuel. Such an arrangement might notably contribute to perpetuate the high position which South Staffordshire has so long maintained as an iron producing district.

Festival of Gas Workmen.—The men employed in the works of the Great Central Gas Company of London are in the habit of enjoying annual excursions, and taking a day from active labor to spend in innocent enjoyment in the country. Two of these excursions came off on the 7th and 14th of July last. The men, accompanied by their own brass band, started off in the morning for the Epping Forest, where they indulged in various recreations, and all passed off pleasantly. On the return of the men to the works, cheers were given for the board of directors, for Mr. Harris, the engineer, and for Mr. Hosslin, the superintendent. The entertainment was closed with a musical performance by the band, and a brilliant display of fireworks.

Asphaltum Cement.—Asphaltum and a small quantity of india rubber dissolved in refined naphtha, make an adhesive cement not affected by water.

GAS-METERS.

On pages 37 and 58 of this volume we reprinted from the *Journal of Gas-Lighting* a portion of Mr. J. O. N. Rutter's paper on Gas-Meters. In a later number of the same journal we find the following note referring to Mr. Rutter's remarks, which may be interesting to some of our readers:

Sir,—I had hoped that some one more capable than myself would have questioned the newly propounded theory of Mr. Rutter, relative to the "science of meter-making;" the contrary, however, being the case, I venture to offer a few observations on the subject.

Mr. Rutter, in his communications, which appeared in the *Journal of Gas-Lighting*, gives an account of a series of chemical and electrical experiments, together with various arguments, in order to establish the theory that gas-meters become galvanic batteries, and that by the agency of electricity certain parts of them are speedily destroyed.

I believe it is generally admitted that to deprive gas entirely of its ammonia, would cause a continuous accumulation of naphthaline in the mains and services; this is a forcible reason why that compound should exist to a limited extent; and it may, therefore, be asserted that some ammonia always passes with the gas to the consumers.

The water in the meter has a great affinity for ammonia, which it absorbs rapidly from the gas in its passage, forming a solution of the alkali, the strength of which depends on the quantity and purity of the gas passed.

The shafts, spindles, bearings, and worms of consumers' meters are made of an alloy of copper and tin (not zinc, as erroneously stated by Mr. Rutter); the ammonia in solution has a great affinity for copper, and comparatively slight affinity for the alloy of copper and tin; to illustrate this, take a piece of pure copper and a piece of meter-shaft (if new, the better), both of about the same dimensions; place each in a separate phial filled with solution of ammonia, when, in two or three days, the pure liquid will become a deep blue, that containing the copper being the darkest color, in consequence of the action being more violent; if these be kept for months, and occasionally supplying fresh ammonia, it would be seen that the copper has suffered most severely, whilst the alloy is comparatively untouched.

These facts will show that the metals are acted on chemically, and that two metals being alloyed, although "antagonist to each other," are not destroyed by electricity, as stated by Mr. Rutter, but purely by chemical decomposition—the tin, not being affected by ammonia, preserves the copper with which it is intermixed. It might be urged that a piece of brass (copper and zinc), subjected to the same experiment, would be destroyed with more rapidity than even the copper alone; but this would not indicate electrical influence, but simply show that ammonia has still a greater affinity for the zinc, and so causes the rapid decomposition thereof.

Mr. Rutter refers to the soldered seams of meter-wheels giving way, which he also attribes to electricity, but shows no reason why. I think it may be with more justice attributed to the presence of bismuth with the solder (which was formerly very frequently employed), which metal may be acted upon by the sulphur in the gas, so causing the solder to be brittle, and break.

The phenomena described by Mr. Rutter, of an inflammable deposit being found on some of the old meter-wheels, and which he attributes also to electricity, I submit is purely chemical, the compound being the ammonia nitrate of copper, a very explosive substance when dry, and which in the early period of gas-lighting, was found in the copper tubes then used for fittings, and was the cause of many severe accidents.

If the theory of destruction by electricity be good, it would be so in all cases: the station-meter, with its cast-iron case, iron shaft, and metal wheel, would, in a like manner, become a galvanic battery: the iron would represent one plate, and the white metal the other, and the latter, being the most feeble, however slow the action, would, in the course of years, manifest the effects of electricity on its surface, but my experience convinces me that if the tar-deposit be cleaned off the white metal, no effects of galvanic action will be seen thereon.

In one thing I agree with Mr. Rutter—that is, the metal employed for the shafts, &c., is not the most suitable, but I do not think his proposition advisable, to make them of iron or steel. The circumstances attending a station-meter and a consumer's meter, are very different; the station-meter once placed is continually in work, but the consumer's meter may be in use three months, and then remain inactive double that period: the results of this inactivity would be—the worm and wheel, or shafts and bearings, or all, would be held fast by the oxidation of the iron. This has been the theory hitherto against the use of iron for this purpose, but I have not seen it applied in practice.

The observations made as to the durability of iron are applicable with greater force to white metal, whilst the evil effects of oxidation are avoided.

I therefore consider an alloy of tin, which would resist the impurities of gas, and, at the same time, be sufficiently hard, would be most desirable for shafts, bearings, &c.; but the difficulty now is expense, for it happens that the metals necessary to form the desired alloy are very expensive, and it would be difficult to convince gas companies of the advantages, so to induce them to pay a price for the instruments compatible with the extra outlay incurred, and this I believe to be the impediment to progress in the construction of the parts alluded to.

In conclusion, I was surprised that in the communication in question, the compound ammonia I have so often referred to was not mentioned; if it had been, it would materially have altered the argments offered by Mr. Rutter.

WILLIAM RICHARDS.

Clerkenwell, E. C., July 12, 1862.

WHAT IS COAL?

Scientific men for a time have treated this question with a prudence akin to that which cautious skaters yield to flaws in the cra·king ice. It is delightful, however, to see this *reticence* gradually disappearing, and the topic once more discussed with a deliberation and lack of sectarian bias, which could hardly have been expected some time ago. One result of the jury trial on the celebrated Torbanehill mineral, in 1853, was to show how much ignorance really existed on this apparently simply question amongst scientific men, and if with them, likewise with the general public. Another result was the dissemination of a vast amount of curious scientific knowledge, and the incentive given to further researches in this special field. It will naturally, then, be expected that new works on geology and mining since published, will devote a greater amount of space to this interesting theme, carefully sifting the vast amount of evidence thus collected with the impartiality which true science demands. In a recent work on Metallurgy, by Dr. Perry, of the School of Mines, London, which is undoubtedly the standard book of its class, the composition, nature and properties of coal are discussed at considerable length. Dr. Perry says: "In the present state of science I do not believe it possible to propose an exact definition of the term coal. Geological position does not afford satisfactory grounds for a precise definition; for the mineral which was the subject of investigation at the trial in Edinburgh occurs in association with coal of the true Coal Measures; and true coal, as far as may be inferred from the assemblage of chemical and physical characters, is met with in other and more recent geological formations. Perhaps the nearest approach to a definition would be the following: Coal is a solid mineral substance, more or less easily combustible; varying in color from dark-brown to black; opaque, except in extremely thin slices; brittle; not fusible without decomposition; not sensibly soluble in ether, benzole, chloroform, or turpentine; not containing sufficient earthy matter to render it incapable of being applied with advantage *as a source of heat in ordinary fire-places or in furnaces.* This would exclude amber and other resinous matters, bitumen and bituminous schists, when they contain so large an amount of earthy matter as to be incapable of being employed as *fuel;* and I think it would also exclude even the most compact varieties of peat." Whatever difficulty there may be of admitting other substances as coal, there can be none as to the Torbanehill mineral. Its color is light-grey, not dark-brown; it is very far from brittle; and, as is well known, is utterly useless either for household or furnace purposes. It is distinctly no coal; and we need not enlarge here on its physical peculiarities, which rank it most closely with bituminous schists, which are above contrasted with coal.—*London Mining Journal.*

RECENT ENGLISH PATENTS.

A patent has been granted to Chas. N. Kernot, of West Cowes, Isle of Wight, for "*Improvement in the method of obtaining ammoniacal salts, and other valuable products, from liquors or substances containing ammonia, and for utilizing the residuum.*"

In this invention it is designed to obtain ammoniacal salts and other valuable products without the aid of heat, from all liquors or substances containing ammonia, as urine, or any other ammoniacal liquor. The liquor (or in case of substances or solution thereof) is to be placed in a suitable vessel or tank together with crude sulphate of zinc, about 4 lbs. to the 200 gallons of urine, or any other ammoniacal liquor; or other sulphates may be substituted for the sulphate of zinc; or a liquid specially prepared from animal or mineral substances, as bones and other phosphates of lime and magnesia, coprolites, apatite, or other mineral phosphates acted upon by a weak solution of acids. Of this solution there is added a sufficient quantity to precipitate all the ammonia contained in the urine or other ammoniacal liquor used; the clear liquid can then be drawn off or filtered, and the solid portion used as a fertilizing agent, or for making sulphates, muriates, and other salts and liquids of ammonia.

The claim is for the precipitation of ammonia and obtaining its salts, and other valuable products from solutions or substances containing ammonia, by sulphate of zinc, or other sulphates, and by solutions prepared from bones and other phosphates of lime and magnesia, coprolites, apatite, phosphorite, or other mineral phosphates, with hydrocloric, sulphuric, or other acids.

James Webster, of Birmingham, England, has obtained a patent in England as well as in this country for "*Improvements in manufacturing oxygen gas, and obtaining certain other products.*" The American claim of Mr. Webster was published on page 44 of this volume. We now give the following abridgment of his English specification.

The invention consists in a mode of treating a mixture of nitrate of soda, or other nitrate, with an oxide of iron or burnt oxide of zinc, for the purpose of obtaining oxygen gas, nitrogenous compounds, and the base of the salt employed. For this purpose, the mixture is submitted to distillation in an iron or other proper retort; the nitrogenous compounds contained in the gaseous product of the distillation are condensed in water, or in any other convenient manner, and those compounds are thus separated from the residue of gaseous products, consisting chiefly of oxygen gas, which is collected in a proper receiver; the residuum in the retort at the end of the process contains the base of the salt employed, which, if it be an alkali or alkaline earth, will be in a caustic state.

The invention is performed and carried out as follows: One part of nitrate of soda and two parts of the sesqui-oxide of iron or burnt oxide of zinc, are mixed well together; the mixture is thrown into a red-hot retort, the lid of which is luted in its place, and the heat kept up. The gas generated is conveyed by a pipe into a condenser, where it is passed through water to extract the nitrous gas and through another similar condenser for a like purpose, and thence to a chamber which contains a number of perforated trays on which is placed spent material from the generator, after having been moistened with water or steam. This acts as a purifier, and removes all nitrogen gas that may be with the oxygen. The gas then passes into the gas-holder. After the gas is all given off from a charge of material in the generator, the spent material is removed, and, after moistening it with steam or water, it is placed upon trays in the purifier, and after a few charges of gas have passed through it, it is removed to another chamber fitted with trays, having an opening near the bottom for a draught hold, where it is exposed to fumes (in preference from metallic iron,

nitric acid being placed on a vessel at the bottom of the chamber). In a short time, when the acid ceases to act, it is withdrawn, the process forming binoxide of nitrogen, which instantly takes up oxygen from the atmosphere, and converts the soda in the trays into nitrite or nitrate of soda, which process is aided by a draught being formed by connection with a flue or by other means. The residue from the manufacture of the gas is also utilized by throwing the said spent material from the generator, whilst hot, into water, and crystallizing the undecomposed nitrate of soda, (and perhaps nitrite of soda) from it. The remaining liquor containing caustic soda, may be further boiled down to hydrate of soda for soap boilers and others. The oxide of iron or burnt oxide of zinc will precipitate and may be used again with other nitrates for the manufacture of gas. In this case the nitrogenous acid is not required, and may be sold or used for other purposes, or the caustic soda solution may have the acid from the first condenser (with perhaps a little nitric acid added) when more nitrate of soda may be crystallized from it; but it is preferred to expose the spent material from the gas to a draught in a chamber with trays as before stated, or to make the caustic soda solution for sale and retain the nitrate of soda and the oxide of iron or burnt oxide of zinc for generating gas.

F. J. Evans, of Westminster, London, has obtained a patent for "*An improved mode of and apparatus for carburetting gases for the purpose of illumination.*"

In this invention the gas to be carburetted is passed through a suitable apparatus where it is heated, while in a heated state it is led off into a vessel containing any easily volatilizable hydrocarbon. As the gas passes through this vessel the hydrocarbon will be vaporized, and combine with the heated gas, whereby the requisite illuminating power will be communicated to it. The mixed gas may then be led off to a burner to be consumed. The form of apparatus which it is preferred to employ for heating the gaseous body, consists mainly of a closed annular chamber formed by two inverted cylinders of different diameters, arranged concentrically and closed at the top. This chamber is mounted on short pillars to permit of access of air to the interior of the inner chamber which forms a combustion-chamber. The inner cylinder is open at the bottom to the atmosphere, and is made slightly conical at that part to increase its diameter. An outlet-pipe fitted to the top of this chamber, and passing through the removable cover of the annular chamber, is employed for ventilating the combustion chamber. Projecting into the combustion chamber is a Bunsen or other suitable gas-burner for imparting the requisite heat to the apparatus. The bottom edges of the two cylinders are provided with flanges, which flanges are connected together by bolts and nuts so as to close the bottom of the annular chamber. Near the bottom of this chamber, a union joint is fitted for admitting gas thereto, and at the top of the chamber is a similar union joint to allow of the escape of the gas. The annular chamber is packed with iron borings or other good heat-absorbing material, removing for that purpose the cover which, when the chamber is filled, is to be replaced and made secure by screws. The gaseous body intended to be carburetted, whether it be atmospheric air or a weak illuminating gas, is then caused to percolate through the heat-absorbing material. After passing through this apparatus, the temperature of the chamber being raised to and maintained at from 60° to 160° Fahrenheit, (according to the quality of hydrocarbon used,) by the flame of the gas-burner, the heated gaseous body will be ready to enter the vessel containing the hydrocarbon. The heat of the gaseous body acting on the hydrocarbon (coal-tar naphtha being preferred) will vaporize the same and luminous a gas will be the result.

The claims are for—

1st. Passing gaseous bodies while in a heated state through vessels containing liquid hydrocarbon for the purpose above described.

2d. The construction of the apparatus, as described, for heating the gaseous bodies intended to be carburetted.

Woodstock, Vt.—We understand that the gas-works at this place are about being altered to make gas under Gwynne's patent.

PETROLEUM ITEMS.

Another New Well.—The Oil City *Register* notices the striking of a new well called the Excelsior Well. This was struck on Thursday, August 7th. It is situated on the John McClintock farm. Oil was obtained at a depth of 512 feet, and is flowing at the rate of about 500 barrels a day. This well is owned by Dr. J. C. Murray, of Sewickly, Pa.; Wm. C. Tilson, Wm. A. Shreeve, of Oil City, and Emor Faucett, of Salem, Ohio. They are said to be men of energy and means, and it is expected that under their management the Excelsior will bring them in a golden harvest.

The Oil Market.—At last accounts several old wells had stopped flowing. The market is quoted as being very firm, with prices advancing.

Alleghany Oil Boats.—The Philadelphia *Coal-Oil Circular* thus describes the boats in which oil is floated to market: The petroleum wharf at Pittsburgh on the Alleghany river, is a greasy sight of an uncommon character. It is covered for over half a mile with barrels of petroleum that have come down the river in boats from the Oil Creek region. A large number of flat boats are also generally lying at the wharf, some of which are discharging their green oily cargoes. These vessels are queer-looking structures, being simply large boxes made of plank, and divided into cells forming tanks, which are made as tight as practicable. They are filled at the oil wells, then closed, and about from twelve to twenty of them are formed into a fleet and floated down the Alleghany river. Some boats carry the petroleum in barrels, but a large number are simply floating oil-boxes. This part of Pittsburgh is redolent with the exquisite odor of Pennsylvania subterranean Eau de Cologne. Refined petroleum may be obtained in Pittsburgh in large quantities for twenty cents and upward per gallon. This burning fluid affords the cheapest known artificial light, and its use has spread from Maine to California, and it is now almost exclusively burned away up in the Lake Superior regions. While it can be obtained at such low prices it will be used as an agent of artificial illumination to the exclusion of all the more expensive agents of light, with the exception of coal gas.

Petroleum Abroad.—The demand for crude petroleum abroad continues very active. In London, Liverpool, and Havre, prices are quoted higher, and the stock is said to be very light.

Oil Creek Railroad.—The wells in Oil Creek alone at Titusville are estimated to produce 900,000 barrels a year, which will all be sent for shipment and consumption to New York by a branch of the Atlantic and Great Western Railway, whose line to the oil wells of Titusville opens this month. As the revenue on which the first mortgage bonds of this line are secured is already stated to exceed several fold the sum required to pay the interest on them, it is clear that when the increase of revenue that will be derived from the enormous traffic of transporting 900,000 barrels from the oil wells is added (to say nothing of the increase of passenger and other traffic which such a trade generates) these bonds, from their first-rate security, will become a favorite investment, the more especially as the application of the funds and revenues of the railway are entirely under the control of capitalists in England, France, and Spain.—*Lond. Money Market Review.*

Petroleum for Gas-Making.—We receive many inquiries from gas-engineers throughout the country, relative to the propriety of adopting petroleum in the place of coal in gas-making. A number of works are being altered to carbonize petroleum—especially those heretofore making rosin-gas, and we hear of new works being built, where it is intended to rely chiefly, if not altogether, on petroleum. This will enhance the demand for the article, and tend to keep prices up.

A Whistling Oil Well.—A novel incident, says the Philadelphia *Ledger*, occurred on the Widow McClintock's farm, Oil Creek, recently. That portion of the tubing of the Van Slyke well which runs into the receiving tanks from the well, was removed, in order to make some repairs, leaving the conductor pipe still in the well. Next morning the inhabitants of that region were startled by the sound of a gigantic steam-whistle, and found that it proceeded from this well. The gas forcing up through the pipe, had probably met with some obstruction, which caused it to perform in this way. The scream of this whistle was tremendous, and could be heard several miles.

Flowing Wells in Canada.—The Oil Springs, Canada, *Chronicle* says: About four o'clock P. M. of Thursday, Mr. E. H. Whipple, of this place, obtained a good flow of oil at a depth of something over 170 feet in the rock. But very little oil was permitted to waste, as a "seed-bag" was immediately fastened to the drill-tools and lowered into the well to a sufficient depth to effectually secure the oil until the gas-pipe can be procured. The well mentioned last week as flowing moderately, and owned by Mr. Barnes, of St. Thomas, has, by further drilling, become one of the best wells here.

Exports of Petroleum.—From the Philadelphia *Coal-Oil Circular*, we take the following tabular statement of exports of petroleum from the United States since January 1st, 1862.

To Africa	galls.	345	$167
Antwerp	"	165,394	56,063
Argentine Republic	"	3,040	1,299
Australia	"	243,675	106,070
Barbadoes	"	1,090	558
Bombay	"	300	132
Bordeaux	"	200	100
Brazil	"	19,105	8,021
Bremen	"	117,465	18,835
British East Indies	"	740	321
British Guiana	"	7,193	2,662
Buenos Ayres	"	1,000	420
Calcutta	"	1,400	640
Canary Islands	"	160	67
Cape Good Hope	"	2,000	1,005
Central America	"	2,059	1,547
Cette	"	2,700	770
Chili	"	16,880	6,442
China	"	1,000	343
Cisplatine Republic	"	3,389	1,845
Cork	"	170,411	29,419
Cuba	"	210,491	24,580
Genoa	"	80	40
Gibraltar	"	117	58
Glasgow	"	18,206	4,002
Hamburg	"	118,997	22,699
Havre	"	392,028	67,652
Hayti	"	3,452	1,477
Liverpool	"	2,291,344	485,700
London	"	742,877	161,529
Marseilles	"	51,735	9,210
Martinique	"	60	30
Mexico	"	4,938	1,770
New Grenada	"	14,232	6,748
North American Colonies	"	3,092	1,301
Otago, New Zealand	"	7,850	3,165
Palermo	"	3,990	1,995
Peru	"	2,651	1,155
Porto Rico	"	18,184	7,569
Provinces	"	5,944	2,229
Queenstown	"	126,450	20,412
Rio Janeiro	"	4,100	2,140
Rotterdam	"	13,091	7,002
Saint Thomas	"	400	225
Sandwich Islands	"	2,400	1,650
South America	"	300	130
Stockholm	"	41,460	16,584
Turk's Island	"	180	119
Venezuela	"	204	92
West Indies (British)	"	16,743	6,836
" " (Danish)	"	3,135	1,406
" " (Dutch)	"	1,850	834
" " (French)	"	950	410
" " (Spanish)	"	9,103	4,370
Total	galls.	4,798,550	$1,127,739

Lenoir's Gas Engine.—The use of gas as a motive power has at length been accomplished. The Paris *Moniteur Universel* says: "The Lenoir motor, of which the principle is the dilation of air by gas inflamed by electricity, has just realized the hopes which we conceived at the time of its first appearance. A machine of six horse power, with two cylinders, operates, at the time we write these lines, the presses of the *Moniteur Universel*." This engine, although exhibited in a small way for some time, has not before, we believe, been applied to a practical use.

THE AMERICAN GAS-LIGHT JOURNAL is published on the 1st and 15th of every month, and is the recognized official organ of

LIGHT, HEAT, WATER-SUPPLY AND SEWERAGE.

Its purpose is to ascertain and make known all new discoveries in the science and economical application of Light, and promote thereby the interests of companies and consumers; to encourage and aid the introduction of Pure Water from Lakes and Rivers into Towns and Cities, and to improve the system of Sewerage, Ventilation, Heating, and Drainage everywhere.

There are 20,000 cities and towns in the United States, capable of supporting gas-works, while there are not 400 gas-works in operation in the whole country!!!

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THE

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PUBLISHED ON 1ST AND 15TH OF EVERY MONTH.

PROPRIETOR, JOHN B. MURRAY. | EDITOR, C. ELTON BUCK.

MONDAY, SEPTEMBER 1, 1862.

The census returns of 1860 afford fruitful subjects for contemplation, particularly to those who are at all interested in the development and growing greatness of the country. Whether taken as a whole, or whether the separate States or cities are singled out, in almost all of them the increase in the manufacturing resources of the country presents a picture painted in glowing colors, and with a variety of tints, each of which will bear a close scrutiny. Let any single branch of manufactures be taken, and compared with the returns of the last general census, and the increase will be gratifying as an evidence of prosperity, which few other countries, if any, have ever been able to claim. These returns may be divided and subdivided, and each particular field of labor examined by itself, and even when thus separated, the increase will be gratifying in the extreme.

The industrial census of New York city—hitherto claiming a preeminence only in the way of commerce, exhibits an enlargement and a degree of prosperity altogether unexcelled. By the census of 1855 the total number of manufacturing establishments in this city, was 2,399, while the census of 1860 swells the amount to 4,259, or an increase of 77.5 per cent.

In 1855 the capital invested in manufactures was $32,426,626, while in 1860 the amount was $60,484,807, or an increase of 86.5 per cent. In 1855 the number of hands, male and female, employed in manufactories was 69,082, while in 1860 the number had increased to 88,453, and excess of 28 per cent. In 1855 the annual value of manufactured articles was $105,877,714, while in 1860 it had grown to $158,030,561, showing an increase of 49.25 per cent.

These figures, which, if they err at all, rather understate the real amounts, show the manufactures in this city to be in a very healthy condition, and prove that the industrial pursuits of commerce and manufactures may go hand in hand, and each find room for the exercise of genius in its own sphere. It has been the cherished desire of some of the prominent merchants of this city, to see commercial business rule with absolute sway, while they have felt very little interest in the promotion of manufactures. But the fact of a diversity of interest being essential to the prosperity of the whole, has stimulated manufacturing industry along with commerce, and the increase of each has been in a measure due to the mutual dependence of the one upon the other.

The figures relating to the manufacture of gas in this city we are sure understate the extent of the business. But assuming them to be correct, they show the prominence of this branch of industry. With a single exception, there is more capital invested in the manufacture of gas, than any other commodity, the one item of clothing being set down as having a capital of $5,645,800, while the census returns estimate the sum invested in the manufacture of gas at $4,000,000. Next to gas is sugar refining, with money invested to the amount of $3,949,000, closely followed by book printing, in which is invested capital to the amount of $3,121,000. The value of the annual products of these manufactures does not bear the same ratio as the capital invested, for while the amount invested in clothing, as above stated, produces an annual value of $17,031,370, or an increase of about three-fold, the annual value of gas produced is less than the capital, being returned at $3,284,500. The capital employed in the manufacture of gas-fixtures is $187,350, of gas-meters $75,000, of lamps and lanterns, $75,500.

Other light-giving materials have considerable sums invested in their manufacture. Among these may be mentioned candles, adamantine, tallow, and wax, having together a capital of $354,000. Coal-oils are returned at $50,000, plumbing and gas-fitting at $247,075.

Of course a large number of hands are employed in these establishments, which the official returns set down as follows: gas, 2,020; gas-fixtures, 578; gas-meters, 120; candles, 112; coal-oils, 12; plumbing and gas-fitting, 379; or a total of 3,301 persons employed in the production of the materials and appliances of artificial light, or 3.75 per cent. of the whole number engaged in manufacturing pursuits in the metropolis.

These figures serve to show the importance of the branches of industry growing out of the requirements of the people for artificial light, but they by no means exhibit the total sum of money indirectly invested in the production of light. The work done for our city gas-works at iron foundries, for castings, such as retorts, mains, &c., and the extensive production of wrought-iron service pipes, &c., do not appear classified by themselves, but enter into the general list as contributing to swell the returns of iron manufactures. One or two large establishments in this city do more work in the way of castings for gas-works, than any other single branch of their trade, and if this amount could be ascertained it would add very largely to the figures above quoted.

Thus it appears that the production of artificial light is a matter of no small importance. In the capital invested, in the raw material used, in the annual value produced, and in the number of hands employed, it will not suffer by comparison with many other departments of industry. The statistics of the whole country will exhibit the figures in still more emphatic language. We intend to recur to the subject at no distant day, and to obtain the data whereby we may ascertain as nearly as possible, the entire amount of capital invested throughout the country in the manufacture of illuminating agents, and of those appliances necessary to their use; and we are convinced that the returns will show an aggregate of which few persons have a just conception.

APPLIED SCIENCE.

The ancient philosophers in their often quoted expressions, that to apply the teachings of science to manufacturing or practical purposes, degrades the mind of the student, have not many supporters at the present day. Fortunately for the progress of the human race more liberal views now prevail, and the influence of the sciences on the arts is universally recognized, and in no part of the world does this recognition prevail to a greater extent than in those countries where science is courted *per se* as a pleasurable recreation, or a healthful discipline of the mind. However thoroughly the the abstract laws of knowledge may be investigated by those whose only aim is mental improvement, and however adverse such adepts may be to a practical application of their enlightenment, there are those whose chief aim is to pursue investigations in the same field, stimulated alike by a love of the subject, and a desire to develop new regulations for manufacturing skill. In seminaries of learning where once the professor's chair was filled with scholars whose highest aim was to shine preeminent as the expounders of laws known only to the chosen few, we now see teachers, equally eminent, whose vocation is to recognize the great truths of science as applied to the arts—thus happily blending the lore of the savan with the more practical knowledge of the workman.

And has this mingling of the practical and theoretical degraded science? Have the discoveries thus applied lowered the tone of scholarship, or so emasculated the minds of philosophers as to weaken their love for further improvement? Have the great triumphs of chemical technology rendered less attractive the fundamental laws upon which the various actions of the elements depend? Or have the students of science become mere apprentices—learning the rules as they would master the rudiments of a trade? The experience of the past few years affords an emphatic denial to these interrogations, and the importance of science in its applications to practical purposes has been vindicated by discoveries of the most useful nature—useful alike to the student of abstract science, and to the operative, whose daily toil is lightened, and whose labors are simplified because directed according to laws, once unknown, but now explained in the most lucid manner.

To no department of science are manufactures more indebted than to chemistry. The important discoveries which have been made in this field of learning, and the progress which has characterized its pursuit within the past few years, are truly wonderful. The realm of organic chemistry in particular has been completely revolutionized, and the labors of those who have pursued their investigations in this direction, have been crowned with the most abundant success. We have published accounts of the investigations of well known chemists who have labored to study the peculiarities of the great family of hydrocarbons. Take coal-tar for example, and witness the fruit of the labors of those chemists who have made it their particular study. A few years ago it was deemed to be a worthless substance, with few uses to which it could be applied. By the aid of chemistry, new compounds have been derived from it; new bodies have been discovered which can at will be produced from it, and what was before to some only a substance disagreeable to both sight and smell, is now by the application of science converted into hues of gorgeous tint, or into perfumes difficult to distinguish from the essences of flowers. The discoveries of the brilliant and beautiful aniline dyes, form an era in the history of applied science, and will only lead to still further investigations, and newer revelations.

The papers read before the last meeting of the British Association for the Advancement of Science, show the growing importance of applied chemistry, and the necessity of its receiving a far larger share of attention in educational courses than is the case at present. In this country, which presents a field superior to any other in the world; where the raw materials for almost every branch of manufactures lay within our own boundaries; where the energy and capital may be found to develop new enterprises; greater attention should be paid to the study of the sciences, and their applications should be taught most thoroughly. The rapid strides which British manufacturers have taken with the past few years, is only the result of a wider diffusion of the laws of science within the same period. English chemists have labored and pursued their investiga-

tions with great assiduity, and English manufacturers have profited by these labors, and applied the knowledge to practice, thus extending the benefits at first conferred. In Germany and France also, where chemistry has for years been cultivated with great care, and where eminent professors have taught, all branches of technology have flourished and attained perfection under the fostering care of applied science.

But not only do manufactures thrive when guided by those acquainted with the laws of science, but agriculture and kindred pursuits owe their advancement to the same cause. By happily blending theory and practice—by recognizing the fact that the operations of nature's laboratory are conducted according to immutable laws, which can be imitated in the workshop of the operative, and which science teaches her votaries to pursue—the daily toil of the artizan may be lightened, and the result of his labors be attained at an outlay of far less exertion than when blindly groping in the dark, unconscious of the *rationale* of his operations. Economy in manufactures; the utilization of products formerly cast aside as worthless, and their conversion into articles of value, have ever followed where the laws of science have been regarded; and only where the true principles of knowledge regulate the routine of work, will profit reward the laborer for his exertion.

Fortunately a growing interest is being manifested in this country in the application of science to the arts. Some of our oldest institutions of learning have added to their otherwise complete courses of study, departments where applied science may be pursued, and where ample means have been provided for conferring knowledge of the most valuable kind. Some of these institutions have been liberally endowed, and possessing a large amount of apparatus, and libraries filled with valuable works, afford the student every facility for research, which a few years ago was to be found only in France and Germany. The Sheffield Scientific School, in New Haven, Conn., may be mentioned as a type of this class. Other institutions of a like character also exist, and from the growing conviction of the value of their teachings, the probability is that each of our colleges will eventually see the necessity of adding to its curriculum a department of applied science.

INCREASE IN THE PRICE OF GAS.

In another column will be found a card of the Manhattan Gas-Light Company, of this city, in which it is stated that after the first day of this month, an additional charge of fifteen cents per thousand cubic feet will be put on the bills of all their consumers, this being the amount laid upon the product of the Company by the tax-bill which now goes into effect. Whether the New York Gas-Light Company will adopt a similar course we are are not apprised.

We cannot but regard this step of the Manhattan Gas-Light Company as very impolitic, and one which in the end will prove to the stockholders the injudicious nature of the change. We do not by any means question the right to increase the price. Of this there can be no doubt; but merely as a question of expediency we deem the action hasty and ill advised.

It is well known, and by none better than themselves, that certain gas-light companies are not regarded by the public with the most friendly feelings. To speak in plainer terms, they enjoy an unpopularity which but few corporations experience, and the expression "odious monopoly" has become so connected with them as to be yielded them by common consent. Whether their past conduct has given just ground for an epithet so opprobrious it is not our purpose now to discuss. We may, however, state in passing, that we cannot see the justice of the term as applied to the Manhattan Gas-Light Company, for which we have ever entertained the kindest feelings; but others differ with us here, and a review of the columns of the daily press for the past few years will show that, however averse we may be to hasrshly criticize the actions of this company, some writers have not refrained from assailing it in the most bitter manner, and have aroused no little feeling against it among consumers generally. Not only have we not assented to aspersions which have been cast upon the management of the company, but we have deprecated the agitations concerning reductions in price, and have endeavored to show the futility of the arguments used on such occasions, when the demands have been made in a spirit of arrogance to which no acquiescence was due.

The Manhattan Gas-Light Company, with the largest capital and largest establishment in the country, ranking fourth in point of size in the world, should be able to furnish gas as cheaply as any similar corporation. There are several works in the United States where gas is distributed at a lower price than that obtained here. If these companies can, with their smaller capitals, afford to sell gas at a lower figure than the Manhattan now charges, surely this company should be able to do the same. Concessions of this nature never injure the parties making them. Cheap gas in England has ever been profitable, and, paradoxical as it may seem, reductions in the price have been followed by increased dividends. Why? The reason is obvious. Consumers have increased, while those who have formerly burned gas have consumed a larger proportion, being less mindful of saving under the reduced rates. If these results have followed in England, why should they not be attained here? In Philadelphia the price of gas has very lately been reduced to two dollars per thousand feet, and although the brilliancy of the light there produced does not equal that produced by the Manhattan Company, still the proportion is not so far out of the way as to fully make up the deficiency in price. We do not advocate a reduction in the price of gas here, but we *do* think it would have been far better had the Manhattan Gas-Light Company assumed the gas-tax without adding it to the bills of consumers. Never had a corporation a better opportunity of making a concession, and had this concession been made the act would have been appreciated, and much of the ill feeling removed, which will now be more agravated than ever before.

We know it is a general rule of trade, that the consumer finally pays government imposts in the increased prices of all commodities. But although the sale of gas legally comes under the same restrictions, yet the circumstances attending the producers of this and other articles are not identical in every particular. In the one instance competition protects the consumer to a very great extent, while, in the other, he is at mercy of a monopoly, from which there is no appeal, and it is from the general unyielding nature of these monopolies that so much distrust of them has been manifested.

Had the Manhattan Company assumed this gas-tax it would have been equivalent to a temporary reduction of fifteen cents per thousand cubic feet, and certainly if they can obtain a price of two dollars and thirty-five cents per thousand, their dividends, which are believed by many to be fabulous in extent, would still be large, and pay a handsome return on the capital invested. Opposition would have been allayed by this course, and the stockholders of the company would have experienced the proud conviction that they were largely aiding the government, without throwing the responsibility on other shoulders.

The loyal people of the United States will shrink from no expenditure to put down this infernal rebellion. Men and money will be furnished without stint, and all the Government asks will be cheerfully given. But let all share the burdens alike. Let not rich corporations attempt to shirk their duty. Let them remember, soulless if they be, that taxation will fall heavily enough upon the people without their adding to the weight; and let them aid in swelling the sums poured into the Government coffers until we shall once more enjoy those times when neither producer nor consumer will be forced to contribute more than their accustomed portion to the support of the country. Let mutual concessions prevail, and mutual forbearance be shown, and let a unity of action be established, and all will be well.

ANSWERS TO CORRESPONDENTS.

L. E. N., of Pa.—*The Philadelphia Gas-Works were constructed in* 1835. *On February* 8*th*, 1836, *they were so far completed as to commence the manufacture of gas, and on the* 10*th of the same month the public lamps in some of the streets were lighted. The number of consumers in January*, 1837, *was* 2,800, *besides* 165 *public lamps. Only fifteen retorts were then in use.*

A. C., of Ohio.—*Mr. Grafton, of England, was the first to introduce the retorts you speak of. Clegg will give you the full information; or, if you cannot procure a copy of this work, Hughes will answer.*

J. E. F., of N. Y.—*Your views are not new. The right to make gas in the way you describe has already been patented.*

B. W. S., of Mass.—*The Canada oil is considered as rather superior to the Pennsylvania oils. It has more body, and, on distillation, yields a less amount of light ends.*

J. L., of Me.—*Your books have been sent, and should have reached you ere this.*

Tyro, of Md.—*We cannot give a positive answer on such slight information as we have had of the process. It appears to work well; but whether this will be maintained with regularity, further experiments alone will prove. We have seen new processes work admirably at first, and when all was supposed to be right, some mishap occurred which placed a very different construction on the prospect.*

H. C. T., of Md.—*The specific gravity of nitrogen is* 0.9713, *atmospheric air being* 1.000.

CORRESPONDENCE.

PETROLEUM GAS.

White Plains, N. Y., August 20, 1862.

To the Editor of the American Gas-Light Journal:

I notice in your last issue a card from Mr. H. Q. Hawley, criticising my experiments on petroleum gas, and leading to the inference that the results obtained by me were under favorable circumstances. In reply to this I would say, that the 225 cubic feet of gas which I obtained from crude petroleum were obtained under the same circumstances which attend our daily operations; and furthermore, I guarantee the quantity stated above may be obtained with any good petroleum when distilled according to my patent process. I have bought some of the heavy oil spoken of by Mr. Hawley, and I have no doubt I shall do better than with crude petroleum, as it possesses greater gravity, and in a few days I will give you the result. I should have tried it before, but as it is an article of limited production, I thought it would not serve the purposes of large gas-works.

In regard to danger, I would say that I have been using the crude petroleum nearly two years, and am satisfied that, with reasonable care, it is entirely safe, and certainly safer than the mixture of atmospheric air and oil-gas of which Mr. Hawley is the advocate and champion, and which is deemed to be extremely dangerous by the most enlightened gas engineers.

Yours respectfully,
W. H. Gwynne,
Civil Engineer.

Bridgeton, N. J.—We lately paid a visit to the gas-works at this place, and seldom have we seen works more admirably arranged, or more neatly conducted. They are under the efficient management of Mr. Uriah D. Woodruff, the president of the company. About four miles of pipe are laid, and gas is furnished to about 350 consumers. Brick's clay retorts are used here, set without tiles, and are pronounced to be far superior to the iron retorts which they have replaced. The meters were made by Code, Hopper & Gratz. Capacity of gas-holder, 11,259 cubic feet. The affairs of this company are in a highly flourishing condition, with prospects of increased buisness in the future.

THE COMING REVOLUTION IN THE MANUFACTURE OF GAS.

In the issues of the AMERICAN GAS-LIGHT JOURNAL of July 1st and August 15th, 1862, the editor foreshadows what is every day becoming more apparent, to wit, the necessity of cheapening gas-light. As now sold it costs much more than kerosene. That oil gives a fine light, and from the improvements making in the construction of the lamps used for it, the trouble of attending them is not great. At present, also, it is very cheap, and there is every indication that it will continue so. Petroleum is now an established product of a great oil territory, and for years will flow at the bidding of its owners. That it does so, is no new fact. It is found all over the world. For centuries the wells at Burmah have yielded yearly many thousand tons, and are now yielding as much as ever—and such has always been the fact when wells have been opened in oil localities. In this country, hitherto, the principal item of cost has been the wagon transportation. To avoid this a railroad is now building to Titusville, Pennsylvania, and will be finished in October. Distilleries will then be able to produce kerosene cheaper than ever, and its effect upon gas companies must be to diminish, and, in time, destroy their profits, unless to protect themselves they sell their light at lower rates. Can gas companies, on the present plan, do so?

If we are to believe engineers, the cost of coal-gas to small companies prevents a fall in price. The same cause also explains the difference in quality between their gas and that made for large cities, the latter generally being from thirty to fifty per cent. richer than the former. It would seem, then, that small companies not only cannot sell their present gas at lower rates, but they cannot afford to make better gas, as that would increase their expenses, and diminish their business just in proportion as they enriched the gas. Whatever, then, may be the case in large cities, in villages coal-gas cannot compete with kerosene. So Eastern engineers admit, and they are waiting patiently for the remedy.

Is their any such remedy? To meet the conditions required for success, whatever method is resorted to must cheapen the manufacture so much that the gas can be sold at a reduced price, or must furnish a very rich gas, and, in that way, cheapen the light to the consumer. In view of the fact that the light from kerosene, *as estimated by consumers*, does not cost one-fourth as much as the light from common coal-gas, it would seem that to compete with kerosene both the above conditions should be embraced in the system adopted. Nothing less than that will answer. Gas companies may as well acknowledge at once that a revolution in the price of gas is inevitable, and that no change of system will save them except it consults the interest of the consumer as well as their own. The longer they hesitate the more the use of kerosene will become a habit, and the more difficult it will be to win back their consumers. This important fact and the large interests at stake should arouse them to investigation. If any other works can be substituted for coal gas-works it is high time it was known, and the object of this article is to make that very inquiry.

As far as the writer's information extends two systems only pretend to success, one for making gas from water, and the other from petroleum. For the former of these systems much is claimed. The latter, as yet, has not been sufficiently introduced to the public to enable them to form any opinion whatever, but, from the information obtained by the writer, hereafter stated, he has no hesitation in giving it a decided preference. Of this, however, the public can better judge from the following comparison:

1. AS TO THE CHARACTER, COST, AND VALUE OF WATER-GAS.

Judging merely from the extraordinary results obtained at the three or four experimental works alone using this system in this country, it would, at first, seem as if it might succeed. Unfortunately for that much desired conclusion, investigation leads to a different opinion. The claims of water-gas, plausible as they are, are not sustained by facts. Not only is the difference in its favor in the cost of manufacture, if any, insufficient to justify its substitution for coal-gas, but otherwise the objections to its use are fatal.

In the first place, from the manner in which the results relied on have been obtained, they have no practical value. Experiments made by patentees or expensive agents, however extraordinary they may be, are worthless as tests. The misfortune of water-gas is, that from its first introduction it has never had anything but just such evidence to rely on. Then as now, the most wonderful results were claimed for it, and, apparently, substantiated by incontestible proof; as there is no doubt that when managed with great skill and care, and while the apparatus is in perfect order, the yield of gas, such as it is, is very great. For instance, in France, in the case of Selligue, 55 cubic feet was said to have been obtained from one pound of mineral oil. In White's experiments in England, like splended results were claimed, and with such apparent reliability, that for more than one year several gas companies, using his system, were induced to continue, in the hope of eventual success. In time, however, in both England and France, water-gas was abandoned, as has hitherto always been the case when it has been subjected to every-day use in ordinary hands, the only test of any value in the manufacture of gas. The plain inference is that unless the works now urged upon the public here are free from the objections which condemned water-gas in Europe, the same fate awaits them here. In fact the very causes which produce the results relied on to establish the value of water-gas, are, in the end, the cause why it is not a practical and economical method. To establish this inference, it is only necessary to trace the history of the Sanders system, the prominent representative of water gas in this country. That inquiry and an analysis of the gas will prove—*first*, that there is no novelty in principle in Sanders' alledged improvements; *secondly*, that in practice there is no economy to the company making water-gas; *thirdly*, that to produce a great yield of water-gas from little oil, and, at the same time, give any body to the gas, a large proportion of it must be carbonic acid and carbonic oxide—the former passing through the burners unconsumed to vitiate the air in the room, and though paid for by the consumer giving him no light, and the latter being one of the most deadly gases to animal life known to man. These latter facts, so important to the consumer (without consulting whose interests gas companies cannot prosper), will be patent to the most inexperienced, when they are informed that water-gas is composed of *very little* olefiant gas, of hydrogen, carbonic acid, and carbonic oxide. Now, hydrogen is the lightest of the gases, and, therefore, if used alone would flow through the burners several times faster than coal-gas can, and unless weighted by the addition of the heavy, non-illuminating, though poisonous gases, would, therefore, cause the consumer great expense from the large amount of gas burnt.

THE HISTORY OF THE SANDERS SYSTEM.

The specification of Professor Sanders to his patent issued July 27, 1858, is published in the *Scientific American* of October 29th, 1859. The claim is there stated to be "carrying the mixed vapors of water and a hydrocarbon formed in the manner described, into a retort containing carbon at a high red heat, for the purpose of producing an illuminating gas." In a reissue of the patent in March, 1860, it was modified to claim "the production of an illuminating gas by passing the vapor of water and a hydrocarbon or its equivalent, mixed previously to decomposition, into a retort containing carbon at a high red heat." By turning to the following detailed histories of water-gas, published in the AMERICAN GAS-LIGHT JOURNAL—one by Mr. Cresson in his report to the gas-light company of Philadelphia, published in the issue of March 1, 1861, another by Mr. Antisell in the issue of May 1, 1860, and another by Mr. Howitz of the Copenhagen Gas-Works, in the issue of June 15th, 1861—the reader will find that the only feature in which the Sanders system differs from the works there described consists in the introduction of the steam and a hydrocarbon *in one and the same retort* to be there decomposed in the presence of incandescent charcoal. Now, in the AMERICAN GAS-LIGHT JOURNAL of December 15, 1860, the owners of the Sanders patent publish a letter of Mr. Hawley, the president of the Aubin Gas-Works Company, showing, as they don't deny the truth of the facts there stated, that in this very feature the gas-works erected under Aubin's patent of 1854 anticipated Sanders. If this be so, the assignees under that patent could erect the very works used by Sanders, as he neither invented or claims the form of his retort. In fact the only possible basis on which the Patent Office could allow Sanders' claim was the addition of the charcoal, not described as used in Aubin's patent, (although, as Mr. Hawley says, *always used in the works erected under it*,) as it was assumed to be necessary, and was an old device in use wherever water-gas was made. Now, add to the above that one of these very Aubin works, so using the charcoal, was erected at Cincinnati in 1852, several years before the date of the Sanders claim, and (as it was in the *Railroad Record* building, and extensively puffed by that that journal) if he, Dr. Sanders, then resided at that city, could scarcely escape his notice, and the proof is complete. Aubin, not Sanders, is the inventor of what is called the Sanders Water-Gas; and whether Aubin's patent can be amended now or not to embrace the use of charcoal, his use of it anticipates, and therefore renders void, the Sanders patent. But there is yet another more important inference from the above facts. It appears that the Aubin patent was offered to Sanders' friends in Philadelphia for a small price. Under the circumstances their declining to buy it when they valued the Sanders patent at millions was a conclusive admission of their want of confidence in the whole system.

2. THE COST OF WATER-GAS.

How discouraging that is when the gas was made by the old methods can be ascertained by reference to the articles on water-gas above quoted. What that cost is by the new methods on trial in this country cannot be known, because common use alone can prove that, and to such test these new methods have not yet been submitted. But as in all methods known for making water-gas the steam is decomposed, not by the direct action of the retort, but from contact with the coke in it, which it constantly tends to cool, and which can only be again heated through the retort; and as this process requires a much higher heat than is used in coal-gas works, and unless narrowly and constantly watched may at any time decarbonize the gas more or less, and burn out the retort; the inference would seem patent that the above conditions governing the expense being the same in *all* methods for making water-gas, in no one of them can the cost be materially diminished.

But even were we to admit that when carefully and fortunately made by the new methods, water-gas would cost less than coal-gas, its manufacture is not practical, because of the great uncertainties attending the operation. If the heat is not just so intense, an excess of carbonic acid is formed (see article on water-gas in the AMERICAN GAS-LIGHT JOURNAL of May 1, 1860), to the detriment of the gas and the cost of the consumer, and the coke cools down rapidly and the yield of gas soon diminishes. Again, if too much steam is used, the coke is cooled down, and little gas, of feeble illuminating power, is made; and if too little, the olefiant gas made is again decomposed, and the retort overheated and in danger of destruction. Now, when we add to all this the fact that, while for the decomposition of steam a large mass of heated coke is required (and hence Sanders now uses a boot-shaped retort), olefiant gas should escape from the retort immediately after being made, or the carbon in it (i. e., the light-giving element) is deposited—it being well known that the same heat which makes this gas will decompose it. We can easily see how uncertain in character water-gas must be, and how impracticable the successful manufacture of it is; and we can readily believe that Mr. Seely (see his report on water-gas, published in the *Scientific American* of November 10, 1860) was right in his suggestion that the water-gas at the Girard House, in Philadelphia, was made from steam in one retort and rosin alone in the other two.

3. THE VALUE OF WATER-GAS.

From the report of Professor Mapes, who acted for the Keystone Gas Company in testing the Sanders' gas at Philadelphia, it required 50 pounds of rosin to carbonize 1,000 feet of gas. (See the AMERICAN GAS-LIGHT JOURNAL of March 1, 1860.) That would be 20 feet per pound. Now, there are gas-works in this country where the yield, without steam, has been 10 and even 15 feet of a very rich gas per pound of rosin, and yet much rich tar passed over. In accounting for the extra 5 to 10 feet made by Sanders, it is not necessary therefore to adopt his hypothesis, to wit, that the hydrogen formed takes

up carbon from the coke. A much simpler explanation exists. The rosin vapor passing through so much hot coke, is all decomposed, the steam mixed with it preserving while it adds to its volume—such addition in quantity of course being at the expense of the quality of the gas. Prof. Sanders says No! (See the AMERICAN GAS-LIGHT JOURNAL of Feb'y 1, 1860.) If you shut off the steam, the rosin alone will make no gas, from which he would have it inferred that the carbon in the gas must come from the coke. The reply to this is, that when the steam is shut off, the excessive heat burns up the rosin gas. That is all. Mr. Seely's report above referred to will make this very plain, and more conclusively yet the test made at Philadelphia in pursuance of his suggestions (see the AMERICAN GAS-LIGHT JOURNAL, of December 1, 1860), by turning off and on the rosin and steam-cocks. When both steam and rosin were used, the production of gas was eight feet per minute. The rosin was then shut off, and the production was seven and a half feet per minute, but the gas was very poor—that is, in the latter case it way hydrogen alone. The inference is very plain. The Sanders gas, like other water-gas, is simply hydrogen enriched, and its value for illumination depends on the amount of olefiant gas in it, the carbonic oxide and carbonic acid adding merely to it volume, for which the consumer pays without receiving an equivalent. Hence a five-foot coal-gas burner burns five feet of it, and gives no more light than two to two and a half feet of pure rosin gas would give through the same burner. And hence also, when not made with great care, the gas is very light and expensive, as conclusively appears from the report of the water-gas operations at Aurora, Ind., published in the AMERICAN GAS-LIGHT JOURNAL of March 1st, 1861. By that report fifty-two consumers only used nightly 4,000 cubic feet of gas, or about eighty feet each, which, it is needless to say, made it the most costly light known.

4. POISONOUS ELEMENTS IN WATER-GAS.

Professor Sanders, in his patent, (see *Scientific American* of October 29th, 1859,) says his gas is composed of 28 atoms of illuminating gas, and 20 atoms of carbonic oxide, or nearly one-half of each. This fact alone should by law prohibit the use of his gas. Eminent chemists have found that one per cent. of carbonic oxide in air will kill a small dog in one and a half minutes, and that half that quantity will kill small birds in three minutes. What, then, would be the effect upon human health when a gas containing nearly 50 per cent of this deadly poison is used in the close and ill ventilated rooms of the poor! especially if, as is claimed by the advocates of water-gas, it has rather a pleasant smell, and therefore leads people to be careless in attending to slight leakage in their gas-pipes. It is fair to presume that this cause, if no other, will in time compel the abandonment of water-gas works, even if no such fatal results from its use occur as was the case at Strasburgh, where the gas escaping into a baker's shop killed several persons. (For an account of carbonic oxide and its poisonous effects, see the article on that subject in the AMERICAN GAS-LIGHT JOURNAL of July 1st, 1862.)

In further illustration of the poisonous properties of carbonic oxide, it may be well to state that at the Hotel des Invalides, in Paris, a water-gas apparatus was stopped by a Government Commission, on the very ground of the danger incurred by the use of this gas.

(*To be continued.*)

GAS EXPLOSION IN ENGLAND.—On Sunday evening, July 6, an explosion of gas occurred in St. Martin's church, Leicester, England, by which considerable damage was done to the building, although no persons were injured. After the evening service was over, a smell of gas was observed near the nave arch of a recently built tower. The sexton applied a lighted match to the place whence the gas was supposed to issue, when immediately an explosion took place. A platform and three pews in the immediate vicinity of the leak were completely demolished, being blown into fragments. One pew was blown with such force against a part of the moulding of the tower as to break it off. The other chair was blown to a height of about eight feet and broken to pieces. The lantern was also demolished.

THE NEW CROTON RESERVOIR.

Tuesday, the 19th day of August, 1862, will be long remembered as the time appointed for the inauguration of the new Croton Reservoir in the Central Park, and for the ceremonies attending the first inletting of the water. This magnificent work of engineering has been in process of construction for more than three years, during a portion of which time 2,000 laborers have been daily employed upon it. As the work approached completion, its importance became more and more magnified in the eyes of the citizens, and to those who frequent the Park for recreation an inspection of the progress of the reservoir has been considered as indispensable. The day appointed for the opening of the gates was auspicious. A clear and almost cloudless sky, cool, bracing weather, and a fresh, invigorating air, lent their aid, and served to draw together a large concourse of people, anxious to witness the first flow of the Croton into the receptacle which had been prepared for it at an outlay of so much money and labor.

Had the completion of this great work occurred at any other time, the councils of the city would have made appropriations of money to celebrate its inauguration in a manner commensurate with its importance. But as the grim visage of war is abroad in the land, and the municipal purse, as well as the private funds of citizens, already are bearing their share of the burthen of the conflict, it was deemed expedient by the city fathers to dispense with costly ceremonies, and to usher in the opening of the gates with merely a few orations, concluding with a collation, to which a limited number of guests had been invited.

At precisely three o'clock, Mr. Alfred C. Craven, the Chief Engineer of the Croton Aqueduct Department, gave the signal for the gates to be opened. Ten streams of water, issuing from as many gates, at once poured into the bottom of the reservoir, five into each compartment. Many of the large concourse of persons expected to see the excavation suddenly filled, little taking into consideration the immensity of the structure, and the comparative smallness of the streams flowing into it, and after waiting until near night-fall a number expressed surprise that but a small part of the bottom of the reservoir was even wetted by the water.

On page 313 of Vol. III., we gave some account of the new reservoir in its then unfinished condition. The following description we take from the columns of a morning paper.

DESCRIPTION OF THE NEW RESERVOIR.

The new reservoir is located in the Central Park, between Eighty-fifth and Ninety-sixth streets, and Fifth and Eighth avenues. It is in a graceful irregular shape, conforming somewhat to the irregularities of the ground, and imparting to this artificial sheet of water the natural appearance of a lake. The only straight lines in the plan of the reservoir are a portion of the point near Fifth avenue, and a short distance on the southwest boundary. The first excavation was made on April 8, 1859, since which time the work has been pushed forward as rapidly as the appropriations and the seasons would permit. The entire amount of land purchased for the reservoir was 106½ acres, of which 96 acres will be covered with water. The cost of the land was $500,000. The reservoir, and the gate-house complete, have cost about $1,500,000. The capacity is estimated at 1,029,000,000 imperial gallons. Its depth is 30 feet. The embankment running around the reservoir, and varying in height according to the natural conformation of the ground, is 15 feet wide on the top, and slopes inward and outward at an angle of 1½ feet to every foot of vertical height. The inside is faced with hydraulic masonry to the depth of 18 inches; the outside will be covered with grass, and the top is smoothed down with solid clay, and graveled. The reservoir is divided into two grand compartments by a bank 33 feet high, 117 feet wide at bottom, and 15 feet wide at top. When the reservoir is full, the top of this bank will be three feet under water, and there will be presented to the eye an uninterrupted lake of 96 acres. It is the largest artificial lake in the world, and has been built in the most thorough and substantial manner.

The three gate-houses are finished, with the exception of a little iron-work. The first gate-house is that by means of which water is taken out of the old aqueduct. It is situated at the corner of Ninth avenue and Ninety-second street. The old aqueduct was here opened for the space of forty-six feet, and a chamber built, combining two sets of gates, one admitting the water to the present receiving reservoir at Eighty-fifth street, and the other into the new junction aqueduct, which leads to the new reservoir. Each channel has five gates, and each set is capable of passing away the entire quantity of water which can be brought to them through the aqueduct. All the water can be sent to the old reservoir or the new one at pleasure, or a portion can be sent to each. The new or junction aqueduct connects this gate-house with the new reservoir, and is 2,629 feet long, and similar in its construction to the old aqueduct. The excavation is through solid rock.

The south gate-house is situated at the south end of the dividing bank. The ledge of natural rock ranged from 5 to 18 feet lower than the required depth for the level of the floor, and this gate-house, like the one on the north, was therefore hewn out from the rock. It has no induction chamber, being arranged only for distribution, for which purpose it is provided with six, instead of four, outlet pipes, each of four, instead of three feet in diameter. Like the north gate-house, it has two pipes, each three feet in diameter, for draining off water from the two divisions of the reservoir, and in all other respects except those mentioned, similar in design and character of work to the north gate-house.

Two of the distribution pipes from the north gate-houses, and all of those from the south gate-houses, have been laid through the Central Park and the Fifth and Eighth avenues. Five of the distribution pipes from the south gate-house are connected with the five main pipes supplying the city from the old reservoir, so that the whole water distribution of the city can be supplied from both or either of the reservoirs at pleasure, and from either division of the new reservoir, as any emergency may require. The sixth distribution pipe from the south gate-house is laid through the Central Park to the Fifth avenue, at Eightieth street, from which point it will ultimately be continued through one of the avenues, to be connected with the general distribution of the city.

The feature of the celebration was the speech of the venerable Myndert Van Schaick, who has been identified with the Croton Aqueduct Department from the earliest epoch of its history. On pages 26 and 137 of of our first volume will be found a sketch of the origin of the Croton Aqueduct, in which the services of this gentleman and the Hon. James B. Murray are recognized. We give the speech of Mr. Van Schaick, which contains an interesting resumé of the history of the Croton Board.

SPEECH OF MYNDERT VAN SCHAICK.

The spectacle which we have been invited this day to witness, is truly full of grandeur.

To supply the city of New York with pure and wholesome water, words now familiar to very citizen, was the early thought of our leading minds in former days. The subject was much discussed in pamphlets and news journals, and some eminent engineers at that time gave the subject their attention. The wells were insufficient, so much so that water was retailed by the bucket at our doors, and not the best in flavor, nor in any great quantity. The Manhattan Company was the next source looked to for even a moderate supply, and it was even proposed to use the Hudson, to change its salt water into fresh, and bring it, by force, into reservoirs, with cumbrous machinery. After years of discussion, it was suggested that the Bronx river might be diverted from its channel and brought to the island. This idea seemed to be the most plausible of any which had been suggested, and for a time it carried the most weight, and seemed to be the most popular.

In this state of public opinion, the cholera of 1832 arrived among us, and as it then so happened that one of my daily official duties was to look after the dead and dying, and, with my associates in the Board of Health, to contrive such measures as would stay or remove this pestilence, nothing struck us with such force, so irresistibly indeed, as the conviction that New York must at once, if possible, be supplied with pure and wholesome water. There was but one sentiment on the subject.

It was made the duty of the committee of the Com-

mon Council, having charge of the subjects of water and sewerage, to seek and collect information in relation to them, and accordingly an official visit was made by it under the lead of the Hon. James B. Murray, as Chairman, to the neighboring city of Philadelphia, which was then in advance of us in many such particulars. Of this gentleman I am proud to speak, as my early and continued friend. Distinguished for his intelligence, his high capacity, and his business talents, his faithful and untiring services to the public and his appreciating constituency, especially during the ravages of that pestilence to which I have alluded, he was and is endeared to all his former associates. To him New York is indebted in a more than ordinary degree for some of the best and purest measures, which in those days emanated from the Common Council.

A passing word must also be said of a gentleman, now no more, who was deeply interested in the efforts to procure a supply of water, the Hon. Samuel Stevens. His unwearied industry and high ability, were exerted to the utmost, and deserve our grateful acknowledgments.

On the 1st of October, 1832, a resolution predicated of all this was introduced into the Common Council by Henry Meigs, Esq., its president, and passed unanimously, instructing the committee on Fire and Water to report such measures as ought to be adopted for securing with the least possible delay the introduction into the city of pure and wholesome water. On the 15th of October the committee reported in favor of further examinations, and the expenditure of $1,000 for the purpose. Shortly after an informal committee of the Board, consisting of Alderman J. B. Murray, James Palmer, Myndert Van Schaick, with De Witt Clinton, Jr., U. S. Civil Engineer, proceeded to an examination of the Bronx river and Rye pond, which were found unavailable.

The next step was an informal meeting of the Fire and Water Committee, invited to my house to consider what next was to be done after this examination, and the report of Mr. Clinton had come in. This meeting was attended only by Peter S. Titus, Assistant Alderman, and Robert Emmet, the Counsel of the Corporation. The bill then prepared passed through the Common Council, and is the law of February 26, 1833.

Under this law, a report from the commissioners was made to the Legislature, and the result of it was the enactment of the organic law of May, 1834, which I prepared and copied in my rooms in Congress Hall, Albany, handed to the Senate as reported, and in its passage through the Legislature, recommended to the Governor the appointment of the same Commissioners.

Under this law, an eminent engineer (J. B. Jarvis) was selected, Col. Clinton having deceased, and under his able advice difficulty after difficulty disappeared.

Well may we assemble together to-day to celebrate an event so auspicious. Nor should we forget to honor those men whose science, practical knowledge, and mechanical labor have contributed to this wonderful work. No one has had a better opportunity than myself, through the means of my long connection with the Croton Board, of knowing how much is due to the eminent ability of Col. Alfred W. Craven, the chief-engineer; to the fidelity and perseverance of those eminent contractors, Messrs. Fairchild, Walker, Coleman and Brown. Nor should we forget the valuable aid we have received from the press of New York, which has never deserted the good cause, but, disagreeing as they might on other subjects, have never been other than unanimous on this. May they always continue to act with equal patriotism and as excellent sense. [Applause.]

If the city of Paris this day has, out of a revenue of 161,000,000 francs, a clear surplus of 92,000,000, equal to $18,400,000, with a population that exceeds our own only by a third, though recently enlarged in its barriers, what may we not expect from the good management of our own? And when the Croton debt is paid, may we not anticipate a large surplus income from this aqueduct, and a reduction in our taxes to an economical standard?

And what will be the verdict of posterity, to whom these perennial waters are to flow down as bright and healthful as ever? Will they not think well of those men, of their sagacity, their enterprise and their perseverance, who created for them such a heritage, and have left them such a priceless possession? [Applause.]

We have gone on here in the North with the steadiness of undisturbed peace, and here is an example of the grandeur of one city of a single State, so advanced in the useful arts, so studious of the welfare of its people, as to continue to the end without pause or panic, in the construction of the greatest and most useful work of the Union. It will be a lesson for future ages, of the nobleness of our objects and the wise application of our strength. And though so large an assemblage will never have occasion to meet here for such a purpose again, the millions of our posterity grateful for the boon we give to-day, will never cease to express their admiration for what has here been done. We have shown to the wondering nations of the old world in this beautiful park and this magnificent hydraulic work, what can be accomplished by earnest and thoughtful republican men, under republican institutions, for private comfort and the common welfare. We have shown how the principle of association carries us through the execution of great public works, the property of all, dear to us all and defended by us all; how we stand by each other in all these enterprises, counsel together over their incipiency, and rejoice together over their happy conclusion; and finally how we have heretofore in the discharge of our duties as citizens, proved ourselves worthy of the privileges we enjoy, worthy of such monuments as these we inscribe to day, and that we will staunchly maintain them to-day and forever, against foreign levy and causeless treason. [Applause.]

Other speeches were made, and an ode composed for the occasion was read, when the invited guests partook of a collation provided by the contractors at their office, where the remaining portions of the day were spent in the interchange of social converse.

Owing to the immense size of the new reservoir, and to the fact that only the surplus water can now be let into it, it will take months before it will be filled. When it shall have been filled, it will present a beautiful appearance, and will be visited not only as a work of hydraulic engineering, but also as a new and handsome feature of the noble park in whose limits it is situated. Hereafter in naming the objects worthy of the visits of a stranger, among the foremost mentioned will be that of "Lake Manhattan."

VORTEX TURBINE WHEELS.

A recent number of the London *Mining Journal* thus refers to the vortex turbine, which has received the encomiums of some of the most prominent hydraulic engineers:

"The turbine has for some years past been slowly introducing itself to the notice of the British public, and in the vortex water-wheel the principle has been so perfectly developed that henceforth the turbine must become a great favorite in all cases where water-power is used. In the western annexe, between the large pumps of Easton & Amos and Gwynne & Co., an excellent specimen of Prof. Thomson's wheel is exhibited by Messrs. Williamson Brothers, of the Canal Ironworks, Kendal, and its action is certainly all that could be desired. Whether compared with the ordinary vertical water-wheel, or with the turbine as usually constructed, this wheel possesses many advantages, and it is, consequently, gratifying to observe that the jurors have awarded a medal to the exhibitors, as well as one to Professor Thomson, for the invention. Compared with the vertical water-wheel, the turbine is cheaper, less expensive to erect, yields the highest obtainable power from a given quantity of water, and is equally efficient for low and high falls. It is not impeded by back water, and can, consequently, be placed below the level of the water in the tail-race, and will make from 100 to 500 revolutions per minute. In addition to these, the turbine has also the advantage of being so small in size that it can be employed in many positions where the ordinary vertical wheel is totally inapplicable, as is frequently the case in the mining districts. Of the Vortex wheel to which we refer it can safely be stated it is the best form of turbine yet conceived. It consists of a moveable wheel with radiating vanes, which revolves upon a pivot, and is surrounded by an annular case, closed externally, but having towards its internal circumference four curved guide passages. The water is admitted by one or more pipes to this case, and, issuing through the guide passages, acts against the vanes of the wheel, which is thus driven round at a velocity depending upon the height of the fall. The water having expended its force, passes out at the centre. The vortex is constructed with the guide blades, which form the passages for the water, either fixed or movable. If the former be employed, the orifices through which the water is directed to the revolving wheel are made of such a size as is necessary for the passage of the quantity of water intended to be consumed when the wheel is in full work. The form is well adapted for use where the water is stored in a reservoir, and the power required is regular, or great economy of water not of moment. In cases, however, in which the amount of power varies considerably at different times, and the saving of water is important, or the supply uncertain, the vortex with movable blades is preferable, though somewhat more expensive. The consumption of water can then be economized to the utmost, as the passages are regulated to correspond with the supply, or to admit only the exact quantity needed to perform the work to be done. For steadiness and regularity of motion the vortex turbine is unsurpassed, and the working model of it is, doubtless, the most attractive portion of Mr. Williamson's display, although their whirlpool centrifugal pump and whirlpool blowing-fan are each worthy of examination.

New York City.—The following circular has been addressed to the consumers of the Manhattan Gas-Light Company of this city:

"Office of the Manhattan Gas-Light Co.,
New York, August 1, 1862.

"The tax of fifteen cents per thousand cubic feet on gas consumed, imposed by act of Congress, which takes effect on the first day of September next, will, in conformity with that act, be added to the bills of this company.

"S. H. Howard, Secretary."

Gas in England.—At York, England, the Gas-Light Company being believers in high prices, and charging roundly for the city lamps, the city corporation intend erecting gas-works on their own account, thus putting a very effectual damper on the monopoly heretofore enjoyed by the existing company. The York *Herald*, referring to this subject, says:

"The citizens are now paying 4s. 6d. per thousand cubic feet for gas, and, according to Mr. Alderman Anderson, the Company is not only dividing ten per cent., but, in addition, are so overburdened with their profits, that they are actually proposing to fall back upon a clause in their act, enabling them to make up the dividends of bygone years, when they paid less than ten per cent., to that sum; and it must also be be borne in mind that they are paying this heavy dividend on two, if not on three capitals. Still, notwithstanding this, they refuse to listen to any remonstrance, and coolly say to the committee—'You cannot help yourselves; we will charge you 4s. 9d. You can get it for no less, and therefore we shall charge you no less.' The cost of erecting works in these days of scientific progress would not be great, and the £2,000 now annually paid for gas would be more than sufficient to pay the interest of the money expended in buildings and plant, as well as cover the cost of the manufacture of the gas required for the public lamps.'

Troy, N. Y.—At a meeting of the directors of the Troy, N. Y., Gas-Light Company, held August 4th, 1862, the following preamble and resolution was adopted:

Whereas, By the Tax-Law the Troy Gas-Light Company will have to pay on and after the first day of September next ten cents on each thousand feet of gas consumed; therefore

Resolved, After the first day of September next, ten cents on each thousand feet of gas consumed will be added to the present charge of three dollars per thousand feet, making the price three dollars and ten cents per thousand feet, with the addition of ten per cent. if not paid within five days after the presentation of the bill.

New Rochelle, N. Y.—Gas works are being erected in this flourishing town. They will be constructed to make petroleum gas.

RETURN OF THE THIRTY-SEVENTH.—This gallant regiment, commanded by Col. Charles Roome, President of the Manhattan Gas-Light Company, have returned from the seat of war, their term of enlistment having expired. They come, however, not to remain, but with the patriotic design of reorganizing and enlisting for the war. The Manhattan Gas-Light Company liberally contributed means to perfect the organization of this regiment, and several of the officers are connected with the gas-light interest. The plaudits bestowed upon this fine body of men as they marched along the streets, sufficiently attested to their martial bearing, and to the approval bestowed upon them by their fellow-citizens.

PHILADELPHIA, PA.—The employees of the Philadelphia gas-works have lately been compelled to take the oath of allegiance to the Government. All the men cheerfully complied, with one exception. The person who refused was a citizen of foreign birth, and demurred on the ground that when he became a citizen he took the oath, and in his estimation that was sufficient. The loyalty of this individual must be rather weak in the knees.

PARAFFIN MATCHES.—One of the most useful applications of paraffin, which will commend itself to the favorable consideration of every one who uses matches—and who does not?—consists in its being employed to communicate the flame to the wood in the place of sulphur. The match is saturated with paraffin, and when the end is lighted it burns readily, and does not give off any suffocating vapors, as is the case with brimstone matches. One of the chief recommendations of this applications is its cheapness, the matches costing no more than those dipped in sulphur.

THE UTILIZATION OF SEWAGE.—Notwithstanding the great results claimed for the use of town sewage as a manure, recent investigations have not confirmed the expectations entertained of it. Dr. Voelcker, one of the most eminent English agricultural chemists, in a paper recently read before the Royal Agricultural Society, said that the results of his observations led him to conclude that however desirable it might be for grass crops, it was next to useless for arable land or green crops, or even for market gardens. In applying it to grass crops, it must be used in great quantities and only at particular times.

PATENTS.

UNITED STATES.

36,060.—C. N. Orpen (assignor to himself and John Gaudu), of New York City, for Improvement in Placing Reservoirs for Lamps:

I claim the socket, a, applied in the reservoir, b, to set over the gas burner, c, as and for the purposes specified.

I also claim the elastic sleeve, d, upon the burner, c, to receive the socket, a, as set forth.

36,065.—W. P. Battey, of Utica, N. Y., and W. N. Taylor, of Philadelphia, Pa., for Improvement in Gas Retorts:

We claim, first, A gas retort so constructed as to be capable of use in reversed position, substantially in the manner and for the purpose set forth.

Second, We claim, in combination with the gas retort, A, the removable heads, F, substantially in the manner and for the purpose set forth.

Third, We claim the use of two or more chambers, in combination with a gas retort, constructed substantially in the manner and for the purpose set forth.

36,071.—J. D. Christie, of Hackensack, N. J., for Improvement in Water Elevators:

I claim the hollow or tubular shaft, B, with the ratchet, D, and flanch, E, attached, in combination with the stationary or fixed shaft, F, with ratchet, G, attached, and the box or drum, I, with pawl, J, secured to it, and the slide or brake, L, fitted in drum, I; the above parts being used with the disk, M, and all arranged for joint operation, as and for the purpose herein set forth.

36,077.—Abram Davis, of Chicago, Ill., for Wind Breakers for Lanterns:

I claim, first, The wind breaker, c c c c, for the top of lanterns and lamps, made of any suitable material, by uniting the frusta of two cones, or their equivalents, which will cause currents of air to pass around the concavities, and escape at the opposite side, without disturbing or extinguishing the flame, as described.

Second, The wind breaker, h h h h, which is a band made of tin or any other suitable metal, or of glass, with a flange at its base, and set in the bottom band, below the perforations, which will turn the current of air up into the chamber above, and prevent extinguishing the flame, as described and for the purpose specified.

36,083.—Philip Griffith, of Philadelphia, Pa., for Improvement in Grate Bars:

I claim a series of bars, A, each bar having a dovetailed recess, for the reception of a dovetailed projection on the adjacent bar, in combination with the block or key, E, the whole being arranged substantially as set forth, for the purpose specified.

36,089.—Samuel Harrison, of Pottsville, Pa., for Improvement in Pumping Engines:

I claim, first, In combination with the triangular sides, A, of the frame, and the inclined cylinder, the arrangement of the steam and exhaust valves with their several operative parts, as herein described.

I also claim the arrangement of the crosshead, K, arm, Y, and the plug rod, V, with its projecting bar and roller, for operating the levers, W X, substantially as described and for the purpose set forth.

I also claim in combination with the regulating pumps, c b, the plungers, rods, arms, latches and catches for regulating the strokes of the engine, in either ascending or descending, or both, substantially as described.

I also claim in combination with a balance beam as herein represented, the connecting of the crosshead that carries the piston and the pump rod, to said beam by means of the rod, I, arranged as herein described and represented.

I also claim in combination with a single-acting pumping engine, the making of the head of the cylinder that is opposite to that one which receives the steam hollow, and connecting it directly with the boiler as contradistinguished from the jacket, by means of a steam pipe, D', for the purpose of making the temperature of both ends uniform, as herein described and represented.

36,090.—C. T. Harvey, of Chicago, Ill., for Improvement in Charcoal Kilns:

I claim my improved or portable kiln, therefore, as made of a metallic covering arranged in convenient segments or sections for construction, or removable, substantially as described.

And in combination with the metal covering, constructed as above described, I claim the use of an interior wall or walls, C, substantially as and for the purpose described.

36,096.—G. H. Kitchen, of New York City, for Improved Portable Apparatus for Manufacturing Illuminating Gas:

First, I claim the tile, f, formed thicker in the middle than at the ends and applied in the manner specified to equalize the heat upon the retort, as set forth.

Second, In combination with the said tile, f, I claim a double casing, a, to aid in retaining heat and equalizing the action thereof on the retort, as specified.

36,102.—O. F. Morrill, of Chelsea, Mass., for Improved Apparatus for Gasifying and Burning Carbon Oils:

I claim the arrangement of the receiving mouths of the conduit, D, above the lower part of the interior of the vaporizer, as described.

I also claim the extension of the conduit, D, as set forth, into the vaporizer, B, and across and over the burner or part, E, thereof, substantially as and for the purpose set forth.

I also claim the screw cap, G, as constructed with the central core or projection, d, and the annular recess, e, arranged within it, and to receive the washer when placed within the screw of the cap, as set forth.

36,119.—Adam Weber, of New York City, for Improvement in Setting Gas Retorts:

I claim the herein described arrangement of setting clay retorts upon separate girders, said girders being supported by an arch or arches built over the fire-place, and arranged in the manner and for the purpose substantially as set forth.

36,140.—J. H. Cotton, of Boston, Mass., for Improvement in the Manufacture of Iron Tubing:

I claim coating iron tubes, as set forth, and subsequently drawing them while cold through dies, in the manner specified, thus producing a tube perfectly cylindrical and smooth upon both its inner and outer surfaces.

36,167.—Martin Rae, of Manchester, England, for Improvement in Lamps. Patented in England, Sept. 16, 1861:

I claim the employment or use of a lighted lamp, taper, or other heat-producing agent at the bottom of, or into the air tube or air tubes of the lamp, arranged to operate in the manner as and for the purpose herein set forth.

36,189.—L. J. Adams, of Cleveland, Ohio, assignor to himself and C. L. Petter, of Rochester, Ohio, for Improvement in Water Elevators:

What I claim is, first, The counter-balance pawl, F, and ratchet wheel, E, in combination with the elongated opening in the box, G, operating as and for the purpose specified.

Second, I claim the elongated opening in the box, G, in combination with the lever, H, and packing, H', operating as and for the purpose specified.

DESIGNS.

1,614.—Wm. H. Green and P. J. Clark (assignor to S. S. Clark), of West Meriden, Conn., for Design for a Lamp Bracket.

PETROLEUM GAS.

THE AUBIN GAS-WORKS COMPANY, OF ALBANY, N. Y., have adapted their Works to petroleum and the heavy oil obtained from its distillation. Parties desiring information will be referred to Village Gas-Works thus adapted, where the ordinary yield of gas is from 150 to 200 cubic feet per gallon of oil. This yield, and the great improvements which experience has added to the Aubin Works, enable them to make a rich gas at a low cost—the only way to compete with kerosene.

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THE INVENTOR AND PATENTEE of a New and Improved Retort for Manufacturing Gas from Wood, Turf, &c., would call the attention of Gas Companies, and the public generally, to an invention which will be a great saving to the community, as they can thereby supply an exceedingly cheap, clear, and brilliant light, besides useful products in profusion. The Works can be seen in successful operation at the Cremorne Gardens, Fourteenth street and Sixth avenue, on application at the office of the Patentee, No. 23 Liberty street, New York, and where any information may be obtained, and where Companies or private individuals wishing to purchase rights for Hotels, Factories, Private Houses, Cities, Counties, or States, will please apply.

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FREEZING OF GAS-PIPES.—Walton's Patent Anti-Freezing Apparatus illustrated by Engravings in the AMERICAN GAS-LIGHT JOURNAL, of Jan. 1, 1861, page 212, is the most simple, durable and efficient of any known process.

See also certificates from Cincinnati, O., and Louisville, Ky. Gas-Works in same number, page

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FLUID FOR GAS-METERS.—The undersigned is prepared to furnish the Glycerine Meter Fluid in quantities to suit purchasers. *It does not evaporate, can be made to stand any degree of cold liable to occur in this country or in Canada, and does not corrode the metals of the meter. It has been in use successfully for the last three years.*

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PATENT BITUMINIZED PIPES,

For the Conveyance of Water, Gas, and Drainage.

This important invention, patented by Mr. Charles Newbold, and now for the first time introduced to the public, may confidently be stated to be one of the greatest interest and commercial value, as the Patent Bituminized Pipes possess all the qualities necessary for the conveyance of Water, Gas, Sewage, Mine-Pumps, &c., viz.: great strength, great durability, and inoxidability, with the immense advantage of being about *one fifth* the weight of iron pipes, and about 35 per cent. cheaper; whilst, compared with lead pipes, the Bituminized Pipes are only about *one fourth* their price, without the possibility of the formation of the oxide and carbonate of lead, so dangerous for every purpose. They will stand 150 degrees of Heat, and after many trials it has been satisfactorily proved that rats or vermin will not touch them. They also withstand the action of all acids and salts.

Iron pipes are at present frequently covered with a coating of bitumen or coal tar before they are laid down; but the adherence of this coating to the metal being very imperfect, on account of vibration and the difference of expansion, this preservation is insufficient, besides being exposed to a number of influences which neutralize its efficacy—galvanic currents materially assist the formation of oxides and deposits, which cause the obstruction and eventually the destruction of metallic pipes.

The Patent Bituminized Pipes are neutral, non-conductors of electricity, and consequently are not exposed to any of the deteriorating influences mentioned above. The process of manufacture of these Pipes consist in causing a roll of paper to pass through a reservoir of melted bitumen, after which it is tightly coiled around a mandril to any required thickness; and thus, when hardened, a tube is formed of perfect texture, great hardness, and enormous strength. These Pipes are proved, by hydraulic pressure, to resist a pressure of 220 lbs. to the square inch, equal to 506 feet head of water, which is more than double the altitude of the highest reservoir. The bituminous composition which unites and covers these Pipes is so well known as an excellent preservative, that it will be unnecessary to demonstrate that, when laid underground, the durability of the Patent Bituminized Pipes may be considered as unlimited. The Pipes are made in lengths of seven feet, and are connected by socket joints of the same material as the Pipes; or they can be fitted with iron flanged sockets, screwed together in a most simple and inexpensive manner.

For Gas these Pipes are invaluable; the Gas-lining which we insert effectualy resists the action of Gas, and being non-conductors, there can be no condensation in them, and the joints made with the Patent Cement are so strong as to entirely prevent Leakage.

The cost of laying the Pipe is also small, compared with those of iron, and can be done by mere laborers. The Bituminized Pipes have been in use the last three years, for the conveyance of gas and have been ascertained to be as perfect now as when first laid down.

DIRECTIONS FOR JOINING THE PATENT BITUMINIZED PIPES.

Pack the pipes level in the ordinary way; slip the collar over one of the pipes; draw the ends close together and warm them by putting a hot iron between them; then press them together so as to make them adhere; take a piece of iron wire netting, about half an inch in the mesh, a little narrower than the length of the collar, and long enough to wrap once round the pipe, spread the collar over it and the joining; close the ends with clay; pour the melted cement into the manhole of the collar, and fill up the interior space; then remove the clay and the joint is finished.

It is necessary to leave a small vent hole in the clay at each end of the collar to allow the air to escape as the cement is poured in, that there may be no flaws or air bubles in it when cold. If in cooling the cement settles in the manhole, fill up again.

N. B.—The cement should be broken into small pieces and melted in a pot as you do lead, at a low temperature, until it is dissolved; it must be stirred while melting; then take it off and keep stiring it as it cools until it becomes nearly as liquid as water; then pour quickly.

All Orders should be addressed to

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OFFICE 24 WATER STREET, BOSTON, MASS.,
J. McGEARY, Agent;

or to FREDERICK W. BOND,
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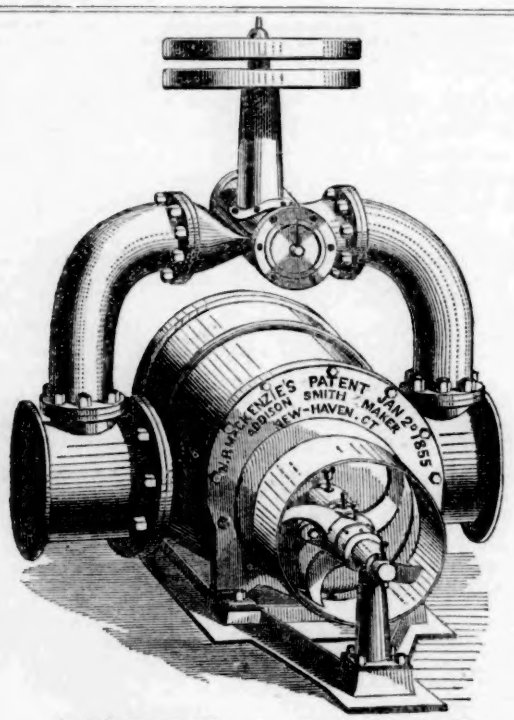

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It hardens under water, as has been fully demonstrated by its application to gas-holders, by many of the largest gas companies in the United States; which companies having thoroughly tested its properties as herein claimed, pronounce in its favor over any other paints in the market, even though sold at double its price.

As a coating for patterns of iron or wood, when mixed with shellac, it is much superior to beeswax, oil, or shellac alone, as has been proven at the large founderies in the country.

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POTTS' REVOLVING SIGNAL LIGHTS,

PATENTED SEPTEMBER 8, 1857.

Mr. ALBERT POTTS, the well known Inventor of the LAMP-POST LETTER BOXES, which have been adopted by the Post Office Department for the large cities of the United States—and also of the GAS METER BOX, to be set in the front walls of houses, thus doing away with visits from Gas Inspectors, or burglars in gas-clothing, has lately brought forward a third Invention, which in point of importance and world-wide usefulness, surpasses the others entirely.

These SIGNAL LIGHTS are intended for use on Vessels propelled by Steam, and those exclusively. They specially indicate the presence of a Steamer, and by their use, there will be less likelihood of mistakes, and consequent collision than at present. They are also intended for SIGNALLING AT NIGHT, and can be used for that purpose UNDER ANY CODE of SIGNALS NOW ARRANGED FOR FLAGS.

This Improvement in Lights for Steam Vessels, consists in having the Lanterns containing the colored lights, connected by means of a series of cogged gearing with some convenient part of the Engine or Machinery, so as to cause them to have a revolving motion around their axis. On side wheel steamers, the Lanterns should be placed directly over the wheel-houses, and the power, or motion to turn them, may then be very conveniently obtained from the paddle wheel shaft. On Propellers, the Lanterns should be placed on each side of the Pilot House, or hurricane deck, and the rotary motion derived from any convenient or suitable part of the Engine or Propeller Shaft. Each Lantern is supported on the end of movable cranes, so that their relative positions may be changed and properly adjusted to suit the view of observers on either side of the vessel at the time of signalling.

The Lanterns to be used in this improvement may be constructed for Burning Oils, Fluids, Gas, or any of the known modes of illumination, and should be furnished with one or more lenses and reflectors, so as to concentrate the rays of light, and project them over the horizon with the greatest intensity. The lenses for this purpose should be made with colored glass, viz., Red and Green, and the position of the respective Lanterns, according to the color of the lenses therein, must be placed on the sides of the vessel so as to answer to the requirements of Rules and Regulations made and published by the Supervising Inspectors of Steamboats, agreeably to the Act of Congress of the United States in such cases made and provided. That is to say—by said Regulation—the Lantern having the green lenses for producing the Green Colored Light, must be placed on the starboard side of the vessel, and the other Lantern producing the Red Light, to be placed on the port side thereof. In pursuance, also, of the aforesaid Rules and Regulations, there is to be found in board and behind each Lantern, a screen to answer the purposes therein mentioned.

The cogged gearing, by which the Lanterns are connected with the Engine or paddle wheel shaft, and thereby caused to revolve when the Engine is in motion, is so arranged that the connection may be readily shipped or unshipped, and the lanterns made stationary or otherwise, at the pleasure of the Pilot, or those whose duty it may be to operate and attend to the same. The cranes on which the Lanterns are placed, are also rigged so as to be readily turned horizontally from one position to another, so as to present one or both lights to the view of observers when laying athwart ships at the time of signalling.

On the Use and Application of the Improvement for Night Signals.

When the vessel is under weigh, or going ahead in its course, the Lanterns are to be placed directly athwart ships, so that such colored light therein will then have the position and place prescribed by Rule Seventh of the aforesaid Supervising Inspectors of Steam Boats, and with the screens behind them, as above described, will then answer all the intents and purposes for which the colored lights are thus required to be used, as illustrated in the several diagrams published by said Inspectors for the working of a system of Colored Lights. The Lights in this case, according to the color seen by the observer, indicate the course or direction of the vessel whereon they are carried. When the Lanterns with the colored lights therein, are made to revolve around on their axis, as proposed in this improvement, in addition to the signal above, another, and as we believe, very important and useful signal is thus formed, indicating that the vessel, whereon it is carried is a Steamer. In dark foggy nights, it is found by experience, to be somewhat of a difficult task to distinguish sailing vessels from Steamers and Propellers, especially when the latter are rigged, and carry a press of sail. When Steamers meet "head and head," it is the duty of each to pass to the right, or, on the larboard side of the other. Whereas, when a Steamer meets a sailing vessel, the former must give way and allow the latter to pursue its course. Hence, to carry out the regulations of the said Steamboat Inspectors, and prevent collisions, it is important to have some infallible sign, whereby the character of the vessel may be readily seen and determined. Several very fatal collisions have recently taken place through mistakes of this kind.

On Signals for Speed and Distance.

The gearing of the Lanterns with the paddle wheel or propeller shaft, may be so arranged as to be an index of their speed. A very good proportion, would probably be to make the Laterns turn about one third as fast as said shaft. Hence, when the speed of the vessel is previously known, when making a certain number of revolutions of the paddle or propeller, it becomes an easy task from observing the time with which the Lanterns thereon may be turning to approximate to the speed with which the said vessel is moving at the time of observation. Again, as the arcs described by the rays of light from each lantern, as they revolve around on their axis, is greater in proportion to the distance from said lantern, so will the time in which said rays move over any given space, be less in the same proportion. Hence, when the lights are very remote, or far off, from the observer, the duration of each column or cylinder, of rays from each lense, would pass the eye of the observer, in a short space of time or with great velocity. Whereas, at a nearer point of observation, the time of its passage would be considerably lengthened, or the motion thereof apparently much slower. From these facts, we believe the improvement is susceptible of indicating, in an approximate manner, the speed and distance of vessels whereon the revolving lights may be used.

On the Application of the Improvement for Marine Telegraphic Purposes.

The Revolving Lights can be readily applied to the general purposes of Marine Signalling at night, as follows: In order to show this application, we have adopted the Numbers as given in Roger's Code of Marine Day Signals, believing that work to be somewhat of a standard in matters of this kind. Instead of the flags used in the above code, for day signals, to indicate the combinations of two or more letters of the Alphabet, which combination is referable to certain numbers indicative of the words or sentences telegraphed, we propose to perform the same operation, at night, by means of the two revolving colored lights, so as to indicate the numbers directly to which the intended words or sentences to be telegraphed are referable. Thus, whether the vessel to be signalled is ahead, astern, or abaft the beam, the position of the two colored lights must be so adjusted, by means of the moveable cranes, whereon said lanterns or lights are fixed, that the two lights may be fully made visible to the observer. When both lights are thrown into this position, stopping the motion of the lanterns may be the signal for calling attention, or a rocket fired off, or the steam whistle blown, would answer the same purpose. Now, in order to represent the ten numerals, we propose to indicate them by the respective motions of the two colored lights, as follows:

RED LIGHT.				GREEN LIGHT.			
One Red,	Represents	Number	1.	Two Green,	Represents	Number	2.
Three do.	do.	do.	3.	Four do.	do.	do.	4.
Five do.	do.	do.	5.	Six do.	do	do.	6.
Seven do.	do.	do.	7.	Eight do.	do.	do.	8.
Nine do.	do.	do.	9.	One do.	do.	do.	0.

In the above arrangement, it will be seen that all the odd numbers are made by the Red Light, and the even numbers by the Green Light. In order to indicate the repeat of the last number, once or more times, or for other special purposes, which may hereafter be found useful and necessary, an even number of lights may be shown by the Red, and an odd number by the Green. It will be understood that when the Lanterns are made with three lenses in them, the numerals as above arranged are formed by the number of times a new light or lense is presented to the observer. Thus to indicate the number 3, the Red Light or Lantern would make one entire revolution; and to make the number 6, the Lantern carrying the Green Light would make two revolutions, and so on with the other numbers. When a symbol is made, the motion of the Lantern is to be suspended for a short time, and when a number expressing a sentence is formed, the lantern may be stopped for a longer period, or some one of the special signals above referred to, may be used for this purpose.

To show the application of this improvement as above mentioned, whereby these Lights can be used as readily for Night Signals, as Flags are used for Day Signals by the author of Roger's Code, we shall use the sign O, colored red or green, according to the light used, to show the number of movements performed by the respective lights in order to represent any desired number of said code, suitable for the required purpose.

RED LIGHT.	GREEN LIGHT.
O, O, O, O, O,	
O, O, O, O, O, O, O.	
	O, O.
	O, O.

The above would represent the number 5722, and by reference to said Roger's Code, would be found to stand before the sentence:

"WILL YOU SHOW THE NUMBER THAT REPRESENTS YOUR NAME?"

RED LIGHT.	GREEN LIGHT.
O.	
O, O, O, O, O.	
O, O, O, O, O, O, O.	
	O, O.

Here the number expressed is 1572, and per the same Code, stands for

"WHERE ARE YOU BOUND?"

RED LIGHT.	GREEN LIGHT.
O.	
O, O, O, O, O, C, O, O, O.	
	O, O.
	O, O, O, O, O, O, O, O, O.

The number thus expressed is 1928, and per said Code is

"WHAT IS YOUR CARGO?"

RED LIGHT.	GREEN LIGHT.
O, O, O, O, O.	
	O, O, O, O, O, O.
	O.
O, O, O.	

Here the number expressed is 5663, and stands for

"HAVE YOU ANY NEWS?"

(RED LIGHT.) (GREEN LIGHT)

Fig. 2

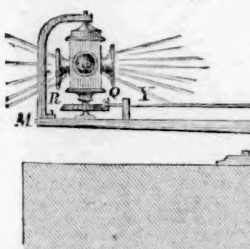

Fig. 1

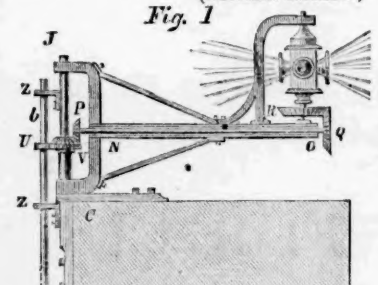

Fig. 3

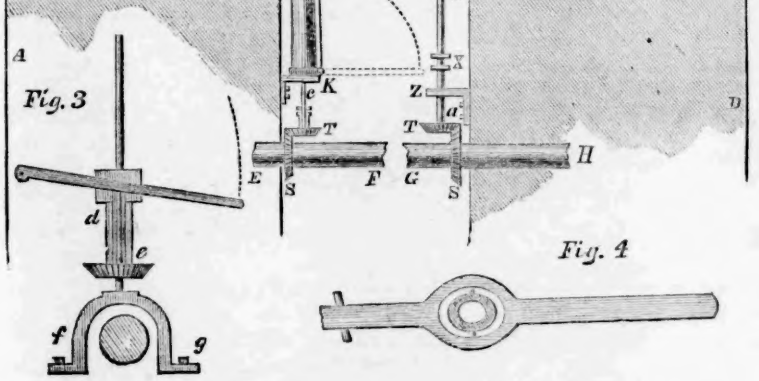

Fig. 4

MECHANICAL CONSTRUCTION.

In our engravings, Figs. 1 and 2, represent Vertical Sections through the wheel-house. In them E F and G H represent portions of the main Shaft. In Fig. 1, I J is a stout Iron or Wooden post, fastened against the side of the wheel-house, directly over the main shaft. On the upper part of this post, is fitted the moveable arm or crane N O, to the main shaft is fitted the bevel wheel S, and to the lower end of the rod a b, is fitted a corresponding wheel T. U is a small pinion on a b, which gears with the spur wheel, V, which in turns gives motion to the wheels, P and Q, and so revolves the lamp R. It will be seen that a Rotary motion is given to the lamp, when the main shaft is in motion and a b connected.

It can be disconnected by a lever, acting between the bosses X, which will elevate the rod in the guides Z Z Z.

Fig. 2 is another arrangement, for the same purpose. In this, K L represent a hollow Shaft, on which is firmly fastened, the arm L M, on which is the lantern. The hollow post is secured to the wheel-house by the straps K and B, and it can turn freely in them, the other part being the same in them as in fig. 1

The lever K W, when drawn down, will turn the frame in any required position around the Shaft c U. In fig. 1, the arm or crane N O, may be operated by cords from the wheel house, but in this device, the rod c U, does not lift up as in fig. 1, but in its place, the lower end is made square, and on it slides the short tube, d E, shown in fig. 3. The lower end of the rod turns on a bridge, f g, spanning the main shaft. On the upper end of the tube, d e, a lever is attached by means of boxes and collars as shown in fig. 4. This lever when raised carries with it the beveled wheel T, thus disconnecting the gearing apparatus.

ALBERT POTTS, Patentee,
PHILADELPHIA, Pa.

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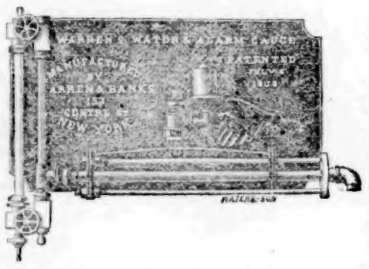

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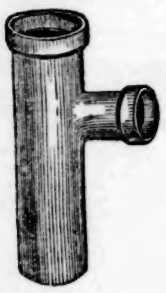

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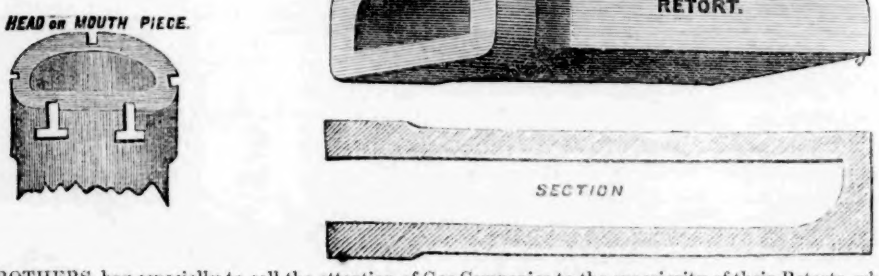

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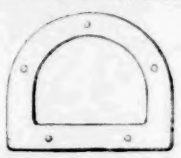

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